

ANNUAL INFORMATION SYSTEMS

PLANNING REPORT 1983

INPUT

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INPUT provides planning information, analysis, and recommendations to managers and executives in the information processing industries. Through market research, technology forecasting, and competitive analysis, INPUT supports client management in making informed decisions. Continuing services are provided to users and vendors of computers, communications, and office products and services.

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ANNUAL INFORMATION SYSTEMS PLANNING REPORT 1983

CONTENTS

	<u>Page</u>
I INTRODUCTION.....	1
A. Scope and Methodology	1
B. Report Organization	3
C. Information Services Industry Trends	4
II EXECUTIVE SUMMARY	7
A. Annual Information Systems Planning Report 1983	8
B. SNA Is IBM's Key to Distributed Processing	10
C. Public Networks Will Become More Expensive	12
D. Budgets Are Growing at a Slower Rate	14
E. Senior Management and IS Concerns Differ	16
F. Personal Computers Are the Most Significant Change Affecting IS	18
G. Computing Is Shifting to the End User	20
H. End-User Computing Occurs at Three Levels	22
I. Communications Is the Lifeline of End-User Computing	24
J. Recommendations to IS Managers	26
III MAJOR CROSS-INDUSTRY ISSUES.....	29
A. Introduction	29
B. Key Computer Industry Events	30
1. Hardware/Software Trends	30
2. Communications Trends	39
C. Annual Survey Findings	49
1. Information Systems Budgets	49
2. Information Systems Planning Issues	55
a. Issue Types	55
b. Issue Groups	55
c. Methodology	57
d. Senior Management Concerns	57
e. Information Systems Problems	59
f. Objectives	63
3. Applications Development	67
4. End-User Computing	74
a. Office Systems	77
b. Information Centers	79
c. Personal Computers	83

	<u>Page</u>
IV INDUSTRY SECTOR ANALYSIS.....	93
A. Introduction	93
B. Discrete Manufacturing Sector	94
1. Industry Overview	94
2. Budget Analysis	95
3. Information Systems Issues	97
a. Senior Management Concerns	97
b. Problems	97
c. Objectives	100
4. Applications	100
5. End-User Computing	106
a. Office Systems	106
b. Personal Computers	106
C. Process Manufacturing Sector	110
1. Industry Overview	110
a. Chemicals	110
b. Petroleum	110
c. Paper Products	110
d. Rubber and Plastics	111
e. Stone, Glass, and Clay	111
f. Primary Metals	111
2. Budget Analysis	112
3. Information Systems Issues	114
a. Senior Management Concerns	114
b. Problems	114
c. Objectives	117
4. Applications	120
5. End-User Computing	123
a. Office Systems	123
b. Personal Computers	123
D. Transportation Sector	126
1. Industry Overview	126
2. Budget Analysis	129
3. Information Systems Issues	131
a. Senior Management Concerns	131
b. Problems	131
c. Objectives	134
4. Applications	138
5. End-User Computing	140
a. Office Systems	140
b. Personal Computers	140
E. Medical	144
1. Industry Overview	144
2. Budget Analysis	146
3. Information Systems Issues	148
a. Senior Management Concerns	148
b. Problems	148
c. Objectives	151

	<u>Page</u>
4. Applications	151
5. End-User Computing	156
a. Office Systems	156
b. Personal Computers	158
F. Services Sector	158
1. Industry Overview	158
a. Legal Services	158
b. Accountants	161
c. Engineering Services	161
d. Construction	162
e. Hotelries	162
2. Budget Analysis	162
3. Information Systems Issues	164
a. Senior Management Concerns	164
b. Problems	164
c. Objectives	167
4. Applications	167
5. End-User Computing	172
a. Office Systems	172
b. Personal Computers	174
G. Utilities Sector	174
1. Industry Overview	174
a. Telecommunications Segment	174
b. Electrical/Gas Sector	178
2. Budget Analysis	178
3. Information Systems Issues	179
a. Senior Management Concerns	179
b. Problems	182
c. Objectives	182
4. Applications	187
5. End-User Computing	189
a. Office Systems	189
b. Personal Computers	189
H. Distribution Sector	192
1. Industry Overview	192
a. Retail Distribution	192
b. Wholesale Trade	194
2. Budget Analysis	195
3. Information Systems Issues	197
a. Senior Management Concerns	197
b. Problems	197
c. Objectives	200
4. Applications	200
5. End-User Computing	205
a. Office Systems	205
b. Personal Computers	207

	<u>Page</u>
I. Banking and Finance Industry Sector	207
1. Industry Overview	207
2. Budget Analysis	210
3. Information Systems Issues	211
a. Senior Management Concerns	211
b. Problems	211
c. Objectives	215
4. Applications	215
5. End-User Computing	221
a. Office Systems	221
b. Personal Computers	221
J. Insurance Industry Sector	225
1. Industry Overview	225
a. Property/Casualty Issues	225
b. Life/Health Issues	226
c. Agency Issues	228
2. Budget Analysis	229
3. Information Systems Issues	230
a. Senior Management Concerns	230
b. Problems	233
c. Objectives	233
4. Applications	237
5. End-User Computing	240
a. Office Systems	240
b. Personal Computers	242
K. Government Sector	242
1. Industry Overview	242
2. Budget Analysis	245
3. Information Systems Issues	247
a. Senior Management Concerns	247
b. Problems	247
c. Objectives	251
4. Applications	251
5. End-User Computing	255
a. Office Systems	255
b. Personal Computers	257
L. Education Sector	257
1. Industry Overview	257
2. Budget Analysis	261
3. Information Systems Issues	261
a. Senior Management Concerns	261
b. Problems	264
c. Objectives	264
4. Applications	269
5. End-User Computing	269
a. Office Systems	269
b. Personal Computers	271

	<u>Page</u>
APPENDIX A: PROFILE OF INTERVIEWED ORGANIZATIONS	275
APPENDIX B: QUESTIONNAIRE	277
APPENDIX C: RELATED INPUT REPORTS	289

ANNUAL INFORMATION SYSTEMS PLANNING REPORT 1983

EXHIBITS

I	-1	Delivery Mode Forecast	5
II	-1	Annual Information Systems Planning Report 1983	9
	-2	SNA Is IBM's Key to Distributed Processing	11
	-3	Public Networks Will Become More Expensive	13
	-4	Budgets are Growing at a Slower Rate	15
	-5	Senior Management and IS Concerns Differ	17
	-6	Personal Computers Are the Most Significant Change Affecting IS	19
	-7	Computing Is Shifting to the End User	21
	-8	End-User Computing Occurs at Three Levels	23
	-9	Communications Is the Lifeline of End-User Computing	25
	-10	Recommendations to IS Managers	27
III	-1	The Evolution of SNA Central Data and Information Bases	31
	-2	The Bell Monopoly Retreat in the Communications Battlefield	41
	-3	Potential Reallocation of Communications Revenues	43
	-4	Communications Cost Convergences	45
	-5	Bell Networks' Use Will Decrease in the Next Three Years	47
	-6	Bell Alternatives Will Increase	48
	-7	Anticipated Budget Changes for 1984, by Company Size	50
	-8	Industry IS Budget Growth	51
	-9	1983 Budget Distribution and 1983/1984 Changes	53
	-10	1983 Budget Per Employee	54
	-11	Information Systems Issue Areas and Groups	56
	-12	Senior Management Concerns	58
	-13	Relative Importance of Information System Problems	60
	-14	Relative Importance of Information Systems Problems, by Industry Sector	61
	-15	Relative Importance of Information Services Problems, by Company Size	62
	-16	Relative Importance of Information Systems Objectives	64
	-17	Relative Importance of Information Systems Objectives, by Industry Sector	65
	-18	Relative Importance of Information Services Problems Versus Objectives	66
	-19	Relative Importance of Information Services Objectives by Company Size	68
	-20	Expected Increases in Fourth-Generation Language Use	69

		<u>Page</u>
	-21 Fourth-Generation Languages (FGL) are Most Significant Aid to Program Development	71
	-22 Distribution of Information Systems Applications: Cross-Industry Versus Industry-Specific	72
	-23 Source of Application Development	73
	-24 An End-User Computing Organization	75
	-25 Median IS Support Personnel	76
	-26 To Whom Does End-User Computing Report?	78
	-27 Extent of Use of Office System Elements	80
	-28 Information Center Installations	81
	-29 Typical Information Center Applications	82
	-30 Fourth-Generation Languages	84
	-31 Departments Using the Information Center	85
	-32 Personal Computer Forecast	86
	-33 Budget Sources for Personal Computer Funds	87
	-34 Current PC Communication	89
	-35 Ratio of PCs with Communication to Total PCs	90
IV	-1 1983 Budget Distribution and 1983/1984 Changes in the Discrete Manufacturing Sector	96
	-2 Relative Importance of Senior Management Concerns in the Discrete Manufacturing Sector	98
	-3 Relative Importance of Information Services Problems in the Discrete Manufacturing Sector	99
	-4 Top Five Information Systems Problems for the Discrete Manufacturing Industry	101
	-5 Relative Importance of Information Services Objectives in the Discrete Manufacturing Sector	102
	-6 Top Five Information Systems Objectives for the Discrete Manufacturing Industry	103
	-7 Relative Importance of Top Five Information Systems Applications for the Discrete Manufacturing Industry	104
	-8 Office Systems and Communications Services Usage for the Discrete Manufacturing Industry	107
	-9 Number of Personal Computers in Discrete Manufacturing Sector Companies	108
	-10 Current PC Communication in the Discrete Manufacturing Sector	109
	-11 1983 Budget Distribution and 1983/1984 Changes in the Process Manufacturing Sector	113
	-12 Relative Importance of Senior Management Concerns in the Process Manufacturing Sector	115
	-13 Relative Importance of Information Services Problems in the Process Manufacturing Sector	116
	-14 Top Five Information Systems Problems for the Process Manufacturing Industry	118
	-15 Relative Importance of Information Services Objectives in the Process Manufacturing Sector	119

	<u>Page</u>
-16 Top Five Information Systems Objectives for the Process Manufacturing Industry	121
-17 Relative Importance of Top Five Information Systems Applications for the Process Manufacturing Industry	122
-18 Office Systems and Communications Services Usage for the Process Manufacturing Industry	124
-19 Number of Personal Computers in Process Manufacturing Sector Companies	125
-20 Current PC Communication in the Process Manufacturing Sector	127
-21 1983 Budget Distribution and 1983/1984 Changes in the Transportation Sector	130
-22 Relative Importance of Senior Management Concerns in the Transportation Sector	132
-23 Relative Importance of Information Services Problems in the Transportation Sector	133
-24 Top Five Information Systems Problems for the Transportation Industry	135
-25 Relative Importance of Information Services Objectives in the Transportation Sector	136
-26 Top Five Information Systems Objectives for the Transportation Industry	137
-27 Relative Importance of Top Five Information Systems Applications for the Transportation Industry	139
-28 Office Systems and Communications Services Usage for the Transportation Industry	141
-29 Number of Personal Computers in Transportation Sector Companies	142
-30 Current PC Communication in the Transportation Sector	143
-31 1983 Budget Distribution and 1983/1984 Changes in the Medical Sector	147
-32 Relative Importance of Senior Management Concerns in the Medical Sector	149
-33 Relative Importance of Information Services Problems in the Medical Sector	150
-34 Top Five Information Systems Problems for the Medical Industry	152
-35 Relative Importance of Information Services Objectives in the Medical Sector	153
-36 Top Five Information Systems Objectives for the Medical Industry	154
-37 Relative Importance of Top Five Information Systems Applications for the Medical Industry	155
-38 Office Systems and Communications Services Usage for the Medical Industry	157
-39 Number of Personal Computers in Medical Sector Industries	159
-40 Current PC Communication in the Medical Sector	160
-41 1983 Budget Distribution and 1983/1984 Changes in the Services Sector	163

	<u>Page</u>
-42 Relative Importance of Senior Management Concerns in the Services Sector	165
-43 Relative Importance of Information Services Problems in the Services Sector	166
-44 Top Five Information Systems Problems for the Services Industry	168
-45 Relative Importance of Information Services Objectives in the Services Sector	169
-46 Top Five Information Systems Objectives for the Services Industry	170
-47 Relative Importance of Top Five Information Systems Applications for the Services Industry	171
-48 Office Systems and Communications Services Usage for the Services Industry	173
-49 Number of Personal Computers in Services Sector Companies	175
-50 Current PC Communication in the Services Sector	176
-51 1983 Budget Distribution and 1983/1984 Changes in the Utilities Sector	180
-52 Relative Importance of Senior Management Concerns in the Utilities Sector	181
-53 Relative Importance of Information Services Problems in the Utilities Sector	183
-54 Top Five Information Systems Problems for the Utilities Industry	184
-55 Relative Importance of Information Services Objectives in the Utilities Sector	185
-56 Top Five Information Systems Objectives for the Utilities Industry	186
-57 Relative Importance of Top Five Information Systems Applications for the Utilities Industry	188
-58 Office Systems and Communications Services Usage for the Utilities Industry	190
-59 Number of Personal Computers in Utilities Sector Companies	191
-60 Current PC Communication in the Utilities Sector	193
-61 1983 Budget Distribution and 1983/1984 Changes in the Distribution Sector	196
-62 Relative Importance of Senior Management Concerns in the Distribution Sector	198
-63 Relative Importance of Information Services Problems in the Distribution Sector	199
-64 Top Five Information Systems Problems for the Distribution Industry	201
-65 Relative Importance of Information Services Objectives in the Distribution Sector	202
-66 Top Five Information Systems Objectives for the Distribution Industry	203

	<u>Page</u>
-67 Relative Importance of Top Five Information Systems Applications for the Distribution Industry	204
-68 Office Systems and Communications Services Usage for the Distribution Industry	206
-69 Number of Personal Computers in Distribution Sector Companies	208
-70 Current PC Communication in the Distribution Sector	209
-71 1983 Budget Distribution and 1983/1984 Changes in the Banking and Finance Sector	212
-72 Relative Importance of Senior Management Concerns in the Banking and Finance Sector	213
-73 Relative Importance of Information Services Problems in the Banking and Finance Sector	214
-74 Top Five Information Systems Problems for the Banking and Finance Industry	216
-75 Relative Importance of Information Services Objectives in the Banking and Finance Sector	217
-76 Top Five Information Systems Objectives for the Banking and Finance Industry	218
-77 Relative Importance of Top Five Information Systems Applications for the Banking and Finance Industry	219
-78 Office Systems and Communications Services Usage for the Banking and Finance Industry	222
-79 Number of Personal Computers in Banking and Finance Sector Companies	223
-80 Current PC Communication in the Banking and Finance Sector	224
-81 1983 Budget Distribution and 1983/1984 Changes in the Insurance Sector	231
-82 Relative Importance of Senior Management Concerns in the Insurance Sector	232
-83 Relative Importance of Information Services Problems in the Insurance Sector	234
-84 Top Five Information Systems Problems for the Insurance Industry	235
-85 Relative Importance of Information Services Objectives in the Insurance Sector	236
-86 Top Five Information Systems Objectives for the Insurance Industry	238
-87 Relative Importance of Top Five Information Systems Applications for the Insurance Industry	239
-88 Office Systems and Communications Services Usage for the Insurance Industry	241
-89 Number of Personal Computers in Insurance Sector Companies	243
-90 Current PC Communication in the Insurance Sector	244
-91 1983 Budget Distribution and 1983/1984 Changes in the Government Sector	246

	<u>Page</u>
-92 Relative Importance of Senior Management Concerns in the Government Sector	248
-93 Relative Importance of Information Services Problems in the Government Sector	249
-94 Top Five Information Systems Problems for the Government	250
-95 Relative Importance of Information Services Objectives in the Government Sector	252
-96 Top Five Information Systems Objectives for the Government	253
-97 Relative Importance of Top Five Information Systems Applications for the Government	254
-98 Office Systems and Communications Services Usage for the Government Industry	256
-99 Number of Personal Computers in Government Sector Organizations	258
-100 Current PC Communication in the Government Sector	259
-101 1983 Budget Distribution and 1983/1984 Changes in the Education Sector	262
-102 Relative Importance of Senior Management Concerns in the Education Sector	263
-103 Relative Importance of Information Services Problems in the Education Sector	265
-104 Top Five Information Systems Problems for the Education Industry	266
-105 Relative Importance of Information Services Objectives in the Education Sector	267
-106 Top Five Information Systems Objectives for the Education Industry	268
-107 Relative Importance of Top Five Information Systems Applications for the Education Industry	270
-108 Office Systems and Communications Services Usage for the Education Industry	272
-109 Number of Personal Computers in Education Sector Organizations	273
-110 Current PC Communication in the Education Sector	274

I INTRODUCTION

I INTRODUCTION

- This report is part of INPUT's Information Systems Program (ISP). It identifies strategic planning issues and trends for information systems. The object is to help information systems (IS) management make effective decisions regarding organization, hardware, software, systems, and procedures.

A. SCOPE AND METHODOLOGY

- The research of this report focuses on systems plans for companies in the following industries:
 - Discrete Manufacturing.
 - Process Manufacturing.
 - Transportation.
 - Medical.
 - Services.
 - Utilities.

- Distribution (Retail and Wholesale).
 - Banking and Finance.
 - Insurance.
 - Government.
 - Education.
- Analysis was performed by company size, where appropriate. The companies were categorized into the following three groups based on revenue, budget authority, or total assets:
 - Less than \$250 million.
 - \$250 million to \$1 billion.
 - Over \$1 billion.
 - The research was based on over 300 interviews with IS organizations. Appendix A shows the distribution of these organizations by size and industry sector.
 - Major vendors were also interviewed to determine product and service trends as well as to determine their perspective on the computer industry in the next five years. INPUT's extensive research base for its Information Services and Field Service programs was also used.

B. REPORT ORGANIZATION

- This report is organized as follows:
 - Chapter I is an introduction and contains an overview of trends in the information services industry in the next five years.
 - Chapter II is an executive summary formatted as a presentation for group discussions.
 - Chapter III describes major issues that are relevant for all industries. This chapter comprises two sections:
 - Key computer industry events of the past year in hardware, software, and communications.
 - Summary of annual survey finds on the following topics:
 - IS budgets.
 - IS planning issues.
 - IS applications development.
 - End-user computing.
 - Chapter IV is a summary of the annual survey finding for each industry sector. The topics are:
 - IS budgets.
 - IS planning issues.

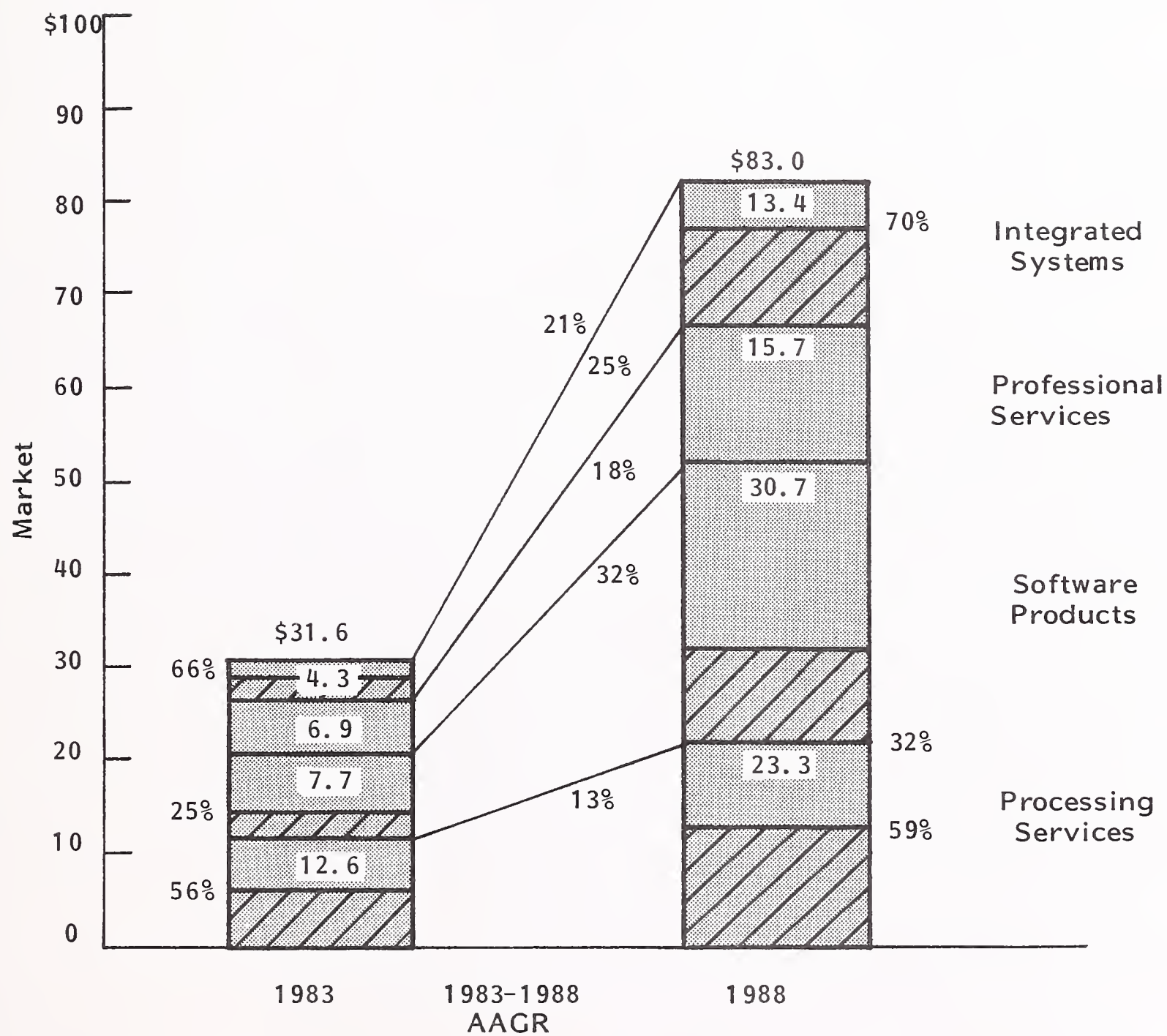
- . IS applications development.
 - . End user computing.
- There are three appendices:
 - Appendix A shows the distribution of interviewed IS organizations by industry sector and size.
 - Appendix B is a copy of the Annual Survey Questionnaire.
 - Appendix C is a brief description of related INPUT reports.

C. INFORMATION SERVICES INDUSTRY TRENDS

- Outside information purchases should grow at a 21% per annum rate over the next five years, as shown in Exhibit I-1.
- In 1983 processing services make up about 40% of the entire industry. That is down from 42% last year and from 46% the year before. By 1988 processing services will represent less than one-third of the industry.
- This rapid decline in relative importance is due to the much faster growth of the other delivery modes, most notably software.
- By 1988, software should be the largest delivery mode - more than a \$30 million market.
- Note that the industry-specific component of all types of services is increasing in importance. In other words it is growing at a faster rate than the service as a whole and faster than cross-industry services.

EXHIBIT I-1

DELIVERY MODE FORECAST (\$ millions)



 = Industry Specific portion of delivery modes

- Integrated systems are already the most industry-specific service and will become more so. While software products as a whole will grow at 32% over the next five years, industry-specific software should grow by 39% a year.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

- This executive summary is designed in a presentation format in order to:
 - Help the busy reader quickly review key research findings.
 - Provide an executive presentation and script that facilitates group communications.
- The key points of the entire report are summarized in Exhibits II-1 through II-9. On the left-hand page facing each exhibit is a script explaining the exhibit's contents.

A. ANNUAL INFORMATION SYSTEMS PLANNING REPORT 1983

- This report was produced as part of INPUT's Information Systems Program (ISP).
- Research was based on over 300 interviews with information systems (IS) organizations in 11 major industry sectors. Major vendors were also interviewed to provide the basis for trend analysis of hardware, software, and communications.
- INPUT's research report:
 - Describes the major events and projects the trends in hardware, software, and communications.
 - Summarizes the findings of the Annual ISP Survey by industry and for all organizations. The topics addressed are:
 - IS budgets.
 - IS planning issues.
 - IS applications development.
 - End-user computing.
- The remainder of this presentation will provide highlights from the INPUT report.

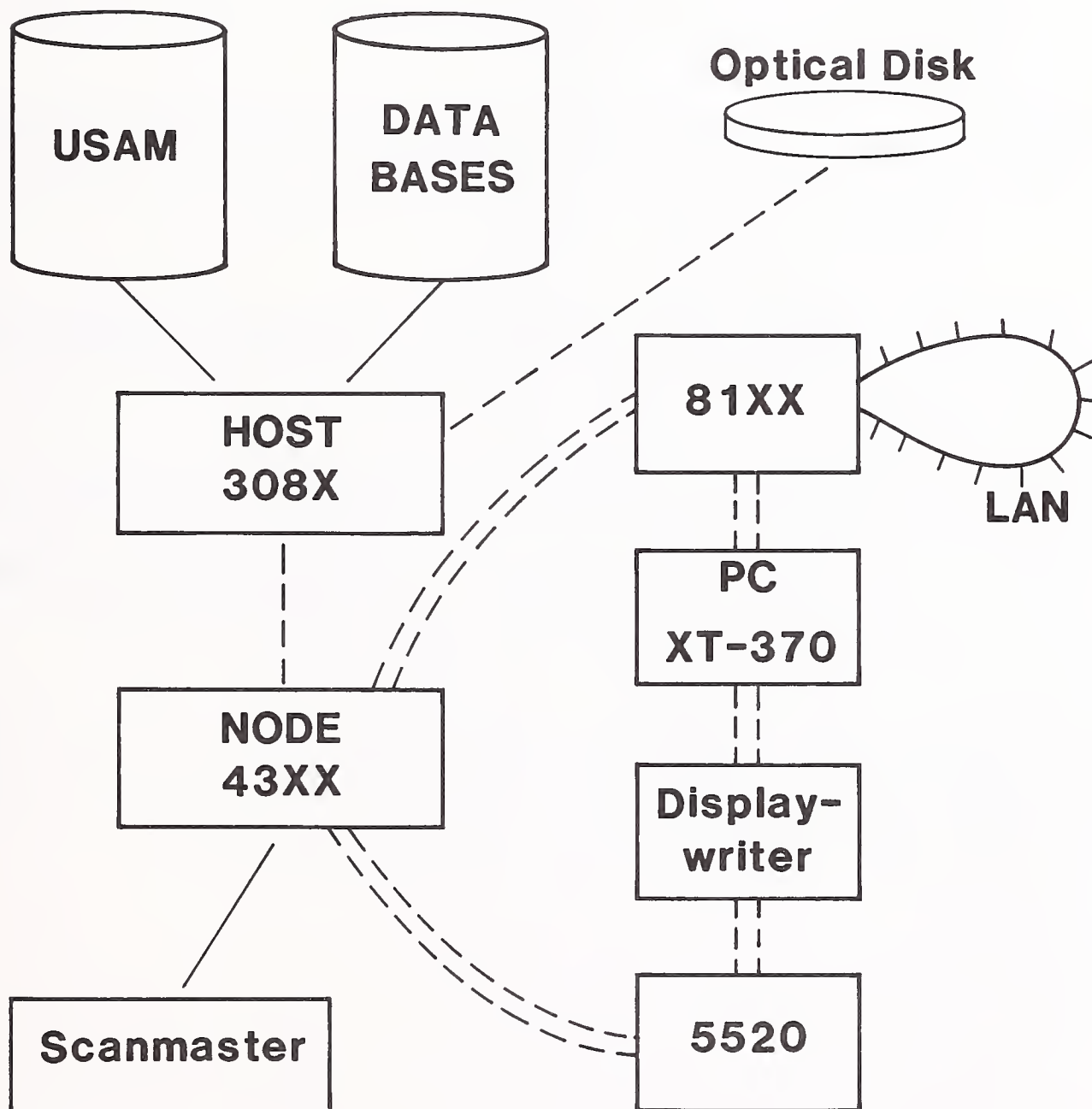
ANNUAL INFORMATION SYSTEMS PLANNING REPORT 1983

- **Research Sources**
 - **Over 300 IS Organizations**
 - **Leading Vendors**
 - **Other INPUT Research Programs**
- **Research Scope**
 - **Trends**
 - **Hardware**
 - **Software**
 - **Communications**
 - **Survey Findings**
 - **Budgets**
 - **Planning**
 - **Applications**
 - **End-user Computing**
 - **Reported**
 - **Across Industry Sectors**
 - **By Industry**

B. SNA IS IBM's KEY TO DISTRIBUTED PROCESSING

- This year IBM has made numerous hardware and software announcements supporting distributed processing and distributed data bases.
 - It announced relational data base system (DB2), which will encourage multiple data base structures of the same data. This may require a hardware solution (data base machine) to solve performance problems.
 - INPUT believes that IBM prefers 43XX as a model processor. The 4361 and 4381 announcements support this belief.
 - Scanmaster, a key component of the office of the future, will be supported from only 43XX and 308X, and not from Series/1 or System 38; that is, SNA support only.
- IBM's PC 370/PC 3270 announcement is an SNA announcement, not a PC announcement.
 - 8100 now has a key role in integrating various office systems. The ability to connect personal computers, word processors (Displaywriter), and administrative systems (5520) amplifies the 8100's strength as a "super controller."
 - PC 370/PC 3270 address distributed processing and distributed data bases with both hardware and software.
- The true hope of the "office of the future" is the reduction of paper. This will be achieved by a combination of communications (e.g., SNA and local-area networks) and cheap storage. The cheap storage solution is the optical disk technology that is now emerging on the market.

SNA IS IBM'S KEY TO DISTRIBUTED PROCESSING



C. PUBLIC NETWORKS WILL BECOME MORE EXPENSIVE

- The public communications structure will become more skewed in favor of residential rather than commercial customers. Business users will be subsidizing residential customers.
- Corporations will have a strong incentive to leave public networks because of increased costs and reduced quality.
 - Prior to deregulation, AT&T provided many services "free," such as network planning. This planning function must now either be absorbed by the corporation or paid for.
 - New vendors will arise and new services will be provided. Services must be evaluated carefully and the viability of the vendor must be considered.
 - New taxes may be applied to private networks to compensate the government for the exodus of public network customers.
- Current network topologies must be examined to determine if the premises initially used to justify them are still valid. Not only have the rules changed in the communications game, but so has the game itself.

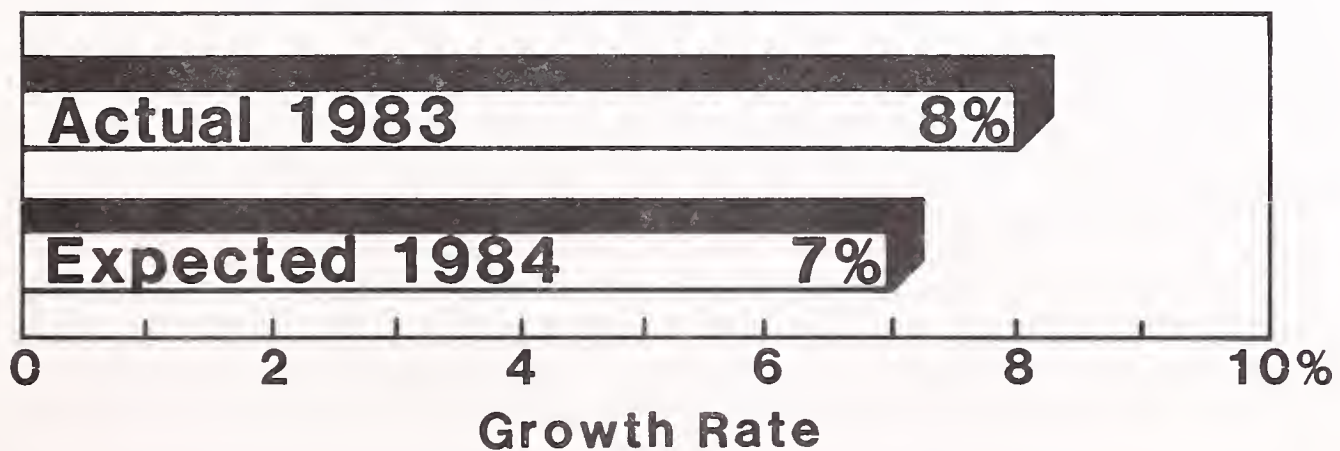
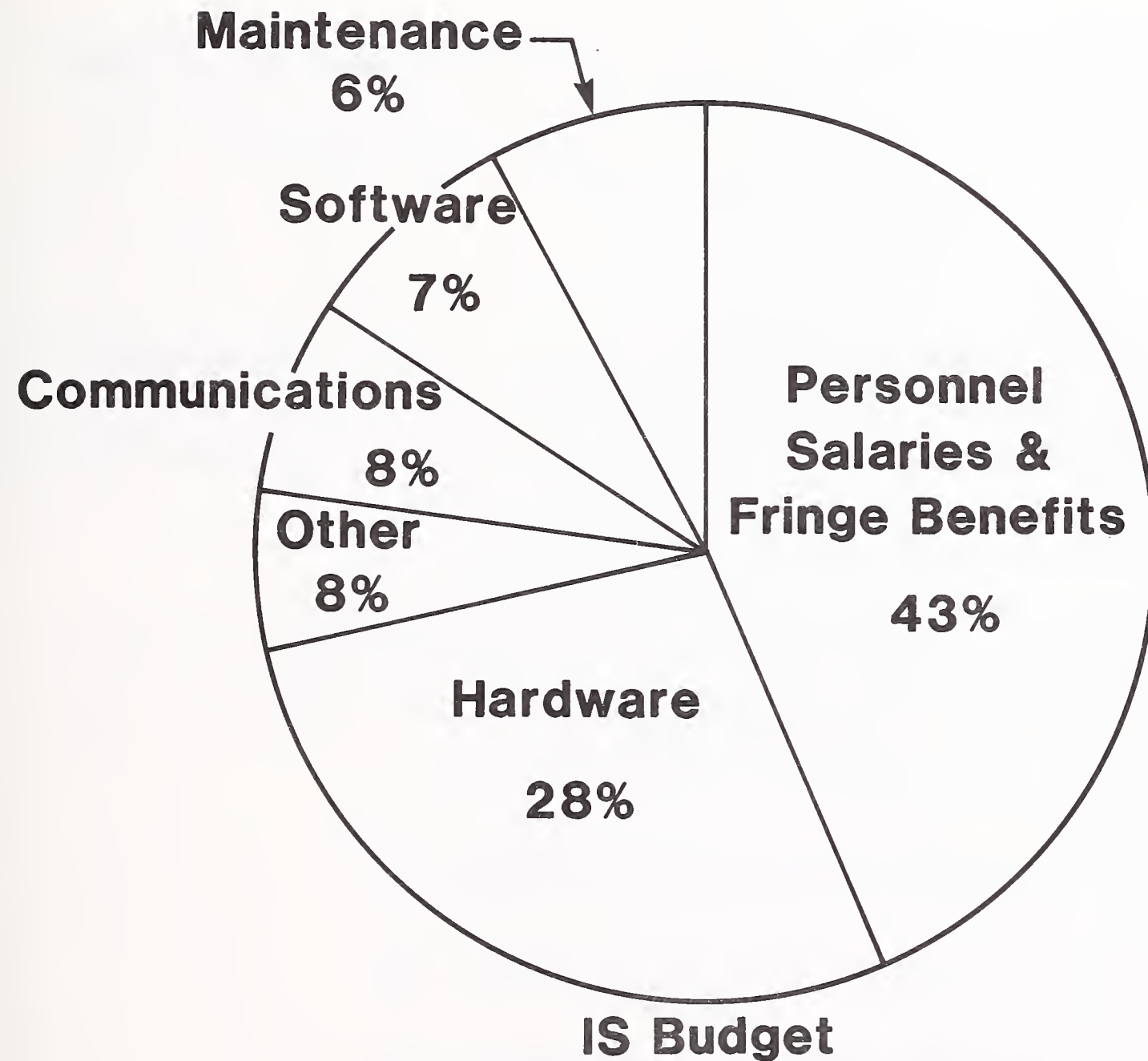
PUBLIC NETWORKS WILL BECOME MORE EXPENSIVE

- **Must Do More Network Managing, Planning**
- **Evaluate More Vendor Options**
- **Reassess Current Network Cost -
Effectiveness**

D. BUDGETS ARE GROWING AT A SLOWER RATE

- The budget distribution for IS departments is similar to the distribution of the past. Communications is beginning to increase its share of the budget. Although hardware has still remained the major nonpersonnel use of IS funds, its distribution has begun to shift from peripherals and terminals toward mini- and personal computers.
- The expected IS budget growth in 1984 is below the actual 1983 growth rate. The actual expenditures on computing by a company, however, are increasing more rapidly.
 - Computing products and services are being acquired outside the IS budgets.
 - The explosion of the personal computer has permeated most company departments.
 - The true cost of computing, once an easy task, is becoming more difficult as each department "pays" for what it needs. The challenge to the corporation and to IS in particular is to identify these costs and to be assured that benefits are being achieved.

BUDGETS ARE GROWING AT A SLOWER RATE



E. SENIOR MANAGEMENT AND I.S. CONCERNS DIFFER

- Cost is by far the most significant concern of senior management. In fact, their number-two concern, hardware, can be viewed as a manifestation of the cost concern.
- IS management has focused on getting its job done. The most glaring problem is applications backlog. Software problems can be viewed as major contributors to the backlog problem. User relations are always a thorn in IS management's side, but no solution has been found.
- IS objectives focus on solving the operational and backlog problems through hardware and software improvements. User relations are not addressed because there appears to be no direct remedy. It is hoped that a smaller backlog and a smoother data processing operational environment will solve this problem.
- IS managers are aware that cost is paramount in the executive's eyes, but IS managers do not assign a high priority to addressing this issue. This difference of opinion may be a source of problems between senior management and IS.

SENIOR MANAGEMENT AND I.S. CONCERNS DIFFER

Senior Management's Concerns

- 1. Cost**
- 2. Hardware**
- 3. Planning**

IS Management's Concerns

- 1. Backlog**
- 2. Software**
- 3. User Relations**

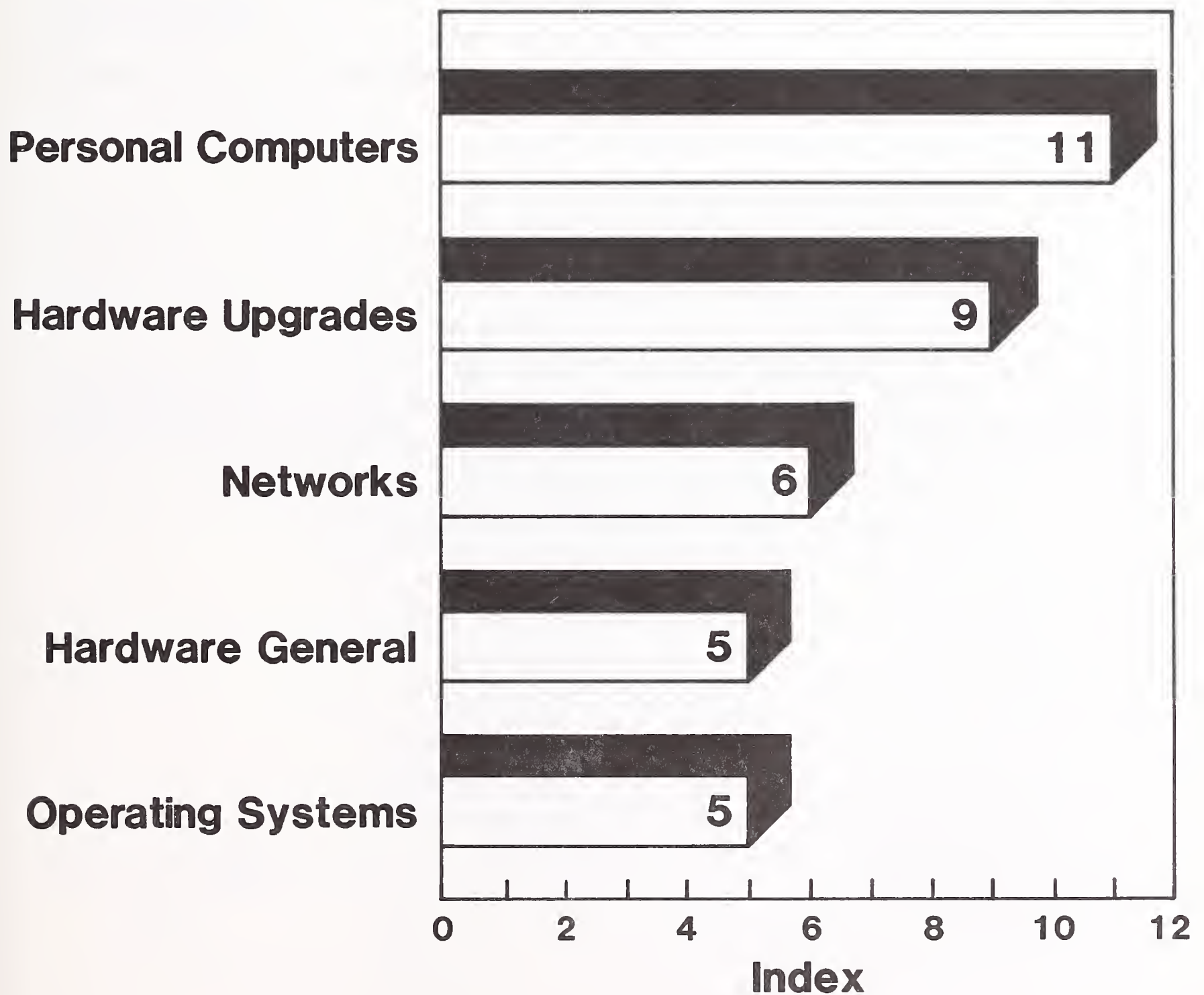
IS Objectives

- 1. Application Software**
- 2. Software in General**
- 3. Hardware Upgrades**

F. PERSONAL COMPUTERS ARE THE MOST SIGNIFICANT CHANGE AFFECTING I.S.

- In the next three years, IS management perceives the use of personal computers to be the most significant change affecting their organizations.
 - The proliferation of personal computers throughout the company has placed new demands on IS for development and support.
 - The use of personal computers as an aid for program development presents an opportunity for productivity improvements.
 - The growing demand for personal computers that access mainframe-based data presents challenges for data security and administration.
- Hardware upgrades are becoming important; the growing demands of data base and fourth-generation systems are applying significant strain on hardware resources. Upgrading hardware without disrupting service to IS and user communities will remain a challenge to the computer operations department.
- Local-area networks (LAN) are becoming more popular because of the users' demand for sharing peripheral equipment by personal computers. The shake-out of LANs at the local level and the volatile environment of public networks (caused by AT&T's divestiture) make networking a key concern in the next three years.

PERSONAL COMPUTERS ARE THE MOST SIGNIFICANT CHANGE AFFECTING I.S.

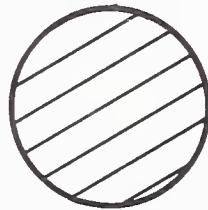


G. COMPUTING IS SHIFTING TO THE END USER

- In 1970 all computer processing was controlled by the IS department. Data may have been provided by the user but IS personnel would enter it into the computer.
- In 1980 things began to change. The number of computer processing transactions was eight times higher than in 1970. The user began to do direct computing. This "computing" was primarily limited to data entry and inquiry, but remote computer services were also being used for some modeling activities.
- By 1990 computing will be 160 times greater than 1970. This increased processing will be distributed among end users (personal computing), departments (local computing), and central host computers (remote computing). Eighty-percent of computing will be done by end users. Decision support systems will be developed and operated by these users. Transaction-based systems will remain, but users will be able to not only access but also manipulate this information. Information will become a true corporate asset. Parochial attitudes on information ownership will change, but the needs for proper controls and security will become increasingly important.

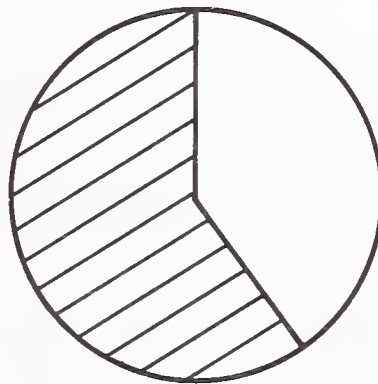
COMPUTING IS SHIFTING TO THE END USER

**Traditional
Computing = 100%**



1970 = 1.0*

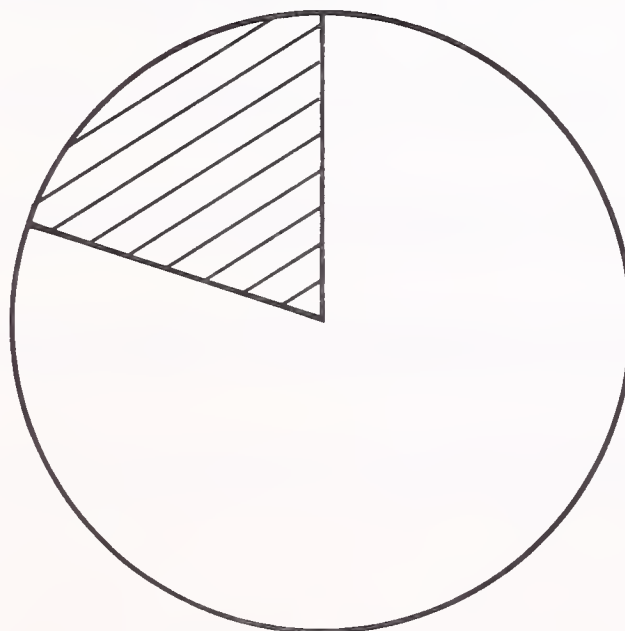
**Traditional
Computing = 60%**



**End-user
Computing = 40%**

1980 = 8.0*

**Traditional
Computing =
20%**



**End-user
Computing =
80%**

1990 = 160.0*

***Relative Processing Power, 1970 = 1.0**

H. END-USER COMPUTING OCCURS AT THREE LEVELS

- Personal computing is epitomized by the personal computer. The use of PCs in a standalone environment could be viewed as analogous to using a combination of a very powerful calculator and an administrative system. The administrative functions include word processing, spreadsheet analysis, and the filing of personal "documents."
- Local computing implies communication among personal systems, either by networking personal computers, by having a shared logic computer at the departmental level, or by a combination of the above. Applications involve sharing information and more powerful calculation-based systems (decision support) that require processing power that is beyond the capabilities of the personal computer.
- Remote computing also depends on communications. The resources of a mainframe computer are utilized when increased processing and data storage resources are needed. Information center access can also be provided on a remote basis.
- The personal, local, and remote levels coexist in true end-user computing. The success of end-user computing is dependent on an effective support strategy. Without proper support, end-user computing will never achieve its true potential.

END-USER COMPUTING OCCURS AT THREE LEVELS

- **Personal Computing**
 - **Administrative System**
 - **Calculator**
- **Local Computing**
 - **Departmental Office Systems**
 - **Decision Support**
 - **Departmental Communications**
- **Remote Computing**
 - **Corporate Office Systems**
 - **Decision Support (Information Center)**
 - **Departmental Communications**
 - **Remote Computing Service Organizations**

I. COMMUNICATIONS IS THE LIFELINE OF END-USER COMPUTING

- Distributed processing is being resurrected. Advances in personal computer hardware and software are allowing data and even programs to be transferred between computers (personal, mini, and/or mainframe). Communication among these computers at the personal, local, and remote levels is the key to exploiting the advantages of each of these levels.
- Office systems are based on communication. Minimizing paper in the office will only occur when information can be sent electronically and the recipient can gain access to it easily. A combination of low-cost storage, availability of workstations, and communication are prerequisites to reducing paper in the office.
- Decision support implies gaining access, regardless of location, to information required for a decision. It requires communication coupled with software that can allow users to gain access to their needed information. The tools are available today. IS is in the best position to apply these tools to the benefit of the corporation.
- IS can lead the end-user revolution and assure its own role as the corporation's computing authority.

COMMUNICATIONS IS THE LIFELINE OF END-USER COMPUTING

- **Distributed Processing**
- **Office Systems**
- **Decision Support**

J. RECOMMENDATIONS TO I.S. MANAGERS

- Cost is senior management's top concern. IS can improve visibility with management by controlling corporate-wide computing costs and effectively defining benefits that systems should deliver.
 - The explosion of end-user computing has unleashed computing expenditures by users throughout the organization.
 - One solution is for IS to take responsibility for office systems development and coordinate all end-user computing. IS would then continue to be the focus for computing in the organization.
- IS has a bad reputation in the user community. This is due to long lead times in development and poor communications between IS and users. End-user computing provides an opportunity to improve this relationship.
 - IS should establish a group of analysts, technicians, and educators to help the users help themselves.
 - Fourth-generation languages provide a vehicle for reducing program development time and increasing users' participation in implementing traditional computer systems.
- IS should coordinate all corporate computing.
 - This includes all facets of end-user computing; user may have responsibility but IS still monitors development and use.
 - Technology is changing rapidly. IS is the only organization that can effectively analyze these changes and thus must stay involved with all aspects of computing in the organization. This is the IS challenge of the 80s.

RECOMMENDATIONS TO I.S. MANAGERS

- **Increase Senior Management Usability**
 - **Focus on Controlling Computing Costs**
 - **Become Responsible for Office Systems**
- **Coordinate All Computer Activities for the Organization**
 - **Technical Expertise**
 - **Computing Experts**
- **Increase User Empathy**
 - **Facilitate End-User Computing**
 - **Respond to Users' Traditional Computing Requirements**

III MAJOR CROSS-INDUSTRY ISSUES

III MAJOR CROSS-INDUSTRY ISSUES

A. INTRODUCTION

- This chapter is organized into two major sections:
 - Key computer industry events.
 - Annual survey findings.
- The key computer industry events section discusses the major events in hardware, software, and communications that occurred during the past year and projects trends based on these events.
- The Annual Survey summarizes and analyzes the responses of 321 IS organizations. Where appropriate, information is segmented by company size or industry sector. This section is divided into the following subsections:
 - IS budgets.
 - IS planning issues.
 - IS applications development.
 - End-user computing.

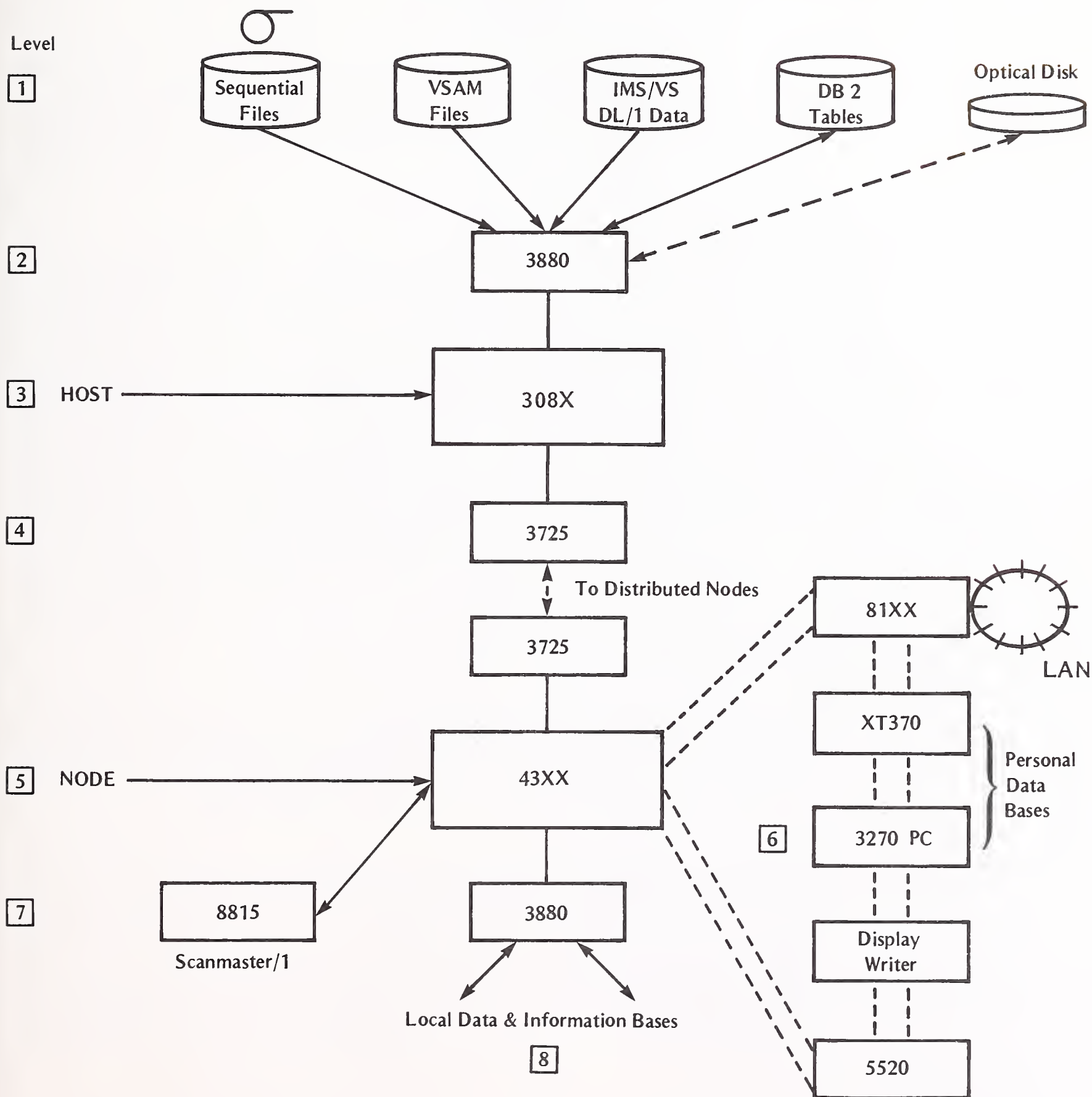
B. KEY COMPUTER INDUSTRY EVENTS

I. HARDWARE/SOFTWARE TRENDS

- Until this year, IBM's system network architecture had evolved at an excruciatingly slow pace for nearly a decade. During the past year, the sheer magnitude of IBM hardware and software announcements supporting distributed processing and, more importantly, distributed data bases indicate that IBM is finally ready to proceed at full speed. The impact on both competitors and customers is going to be substantial. Exhibit III-1 presents a general diagram of SNA, with seven major levels of activity identified for analysis and discussion.
- The traditional strong central host control of SNA was partially justified on the basis of avoiding duplicate data bases. However, the announcement of a relational data base system (DB2) for large IBM systems will have some predictable effects on the central data/information base. One effect will be the encouragement (if not requirement) of multiple structures of the same data (level 1).
 - Along with DB2, the ability to create relational tables from data extracted from sequential files, VSAM files, and IMS/VS (and DL/I) data bases was provided through the use of a data extract facility (DXT).
 - The obvious result (regardless of how attractive it may be) is the production of duplicate data bases for archival, transaction, and planning purposes. The potential increase in on-line storage may be gauged by the fact that DB2 is capable of handling relational data bases (tables) of up to 64 gigabytes.

EXHIBIT III-1

THE EVOLUTION OF SNA CENTRAL DATA AND INFORMATION BASES



- Anticipated increases in the size of central data bases will also increase the portion of IS budgets that goes for on-line storage. It is INPUT's opinion that these increases will speed the development and acceptance of optical disk storage (because of cost, capacity, and space considerations). (STC announced its IBM-software-compatible optical disk system in October, 1983.)
- Under any circumstances look for a substantial percentage increase in the cost of disk storage systems relative to mainframe processor costs. The current and anticipated demand for on-line storage seems virtually unlimited at this time.
- The improved feasibility and ease of use offered by relational systems will be compensated by a loss of processing power. (Because of performance problems, IBM delayed for a number of years the announcement of a relational data base system for use against large data bases. Even with today's large-scale processors, INPUT projects that some type of hardware assistance will be required for data base processing. This assistance may take the form of a backend data base machine (possible replacement for the 3880 at level 2), or it may take the form of architectural changes in the 308X replacement (level 3). In fact, as distributed processing proceeds, the large central host may be considered primarily an enormous data base machine (with super computers for really heavy scientific processing).
- It is probable that these enormous data base engines are going to require operating systems that go well beyond MVS/XA, and conversion to that system should be viewed as only an interim step.
- It is also probable that many mainframe communications functions will have to be offloaded as networks grow. INPUT's long-standing concern about the 3705 was not removed with the announcement of the 3725 earlier this year. A major change in communications processors (level 4) is still going to be required. A separate processor of considerable

power (and with enormous storage capacity) will be required for network management purposes.

- It has long been INPUT's opinion that IBM prefers (and encourages through price/performance and software support) the 43XX as a nodal processor (level 5) rather than as a minicomputer or a small business system (such as a System 38). This opinion is substantiated by recent IBM announcements.
 - The 4361 and 4381 announcements in September demonstrated the main focus of IBM's distributed-processing strategy.
 - The 4361 is supported with both hardware and math packages that, for scientific processing, make it highly competitive with minicomputers.
 - The 4381 supports MVS/XA and provides the necessary software bridge to the 308X growth path.
 - Scanmaster/1, whose announcement is important to the office of the future, is supported from the 43XX and 308X, and not from Series/1 or System 38.
 - When XA was announced in 1981, the Remote Operator Console Facility (ROCF) (which would permit unattended operation of the 43XX at SNA nodes) was also announced. Even though this facility has not now been enthusiastically endorsed, it is felt that the situation will change for several reasons:
 - IBM has now given its wholehearted support to the distribution of both processing and data bases.
 - A software-compatible alternative is scheduled to appear on the market in the near future.

- As the nodes grow (in terms of hardware investment), cost justification will be difficult (if increased operational personnel costs are included).
- The coordination of current and future office products (that will be connected to local area networks) with the data/information bases to support them will require mainstream processors and software with substantial growth potential.
- In 1980 IBM announced that "over time" it would provide for document interchange capability among its various office systems and terminals. Although this time has been slow in coming, substantial progress was made during the October "blockbuster" announcement of the XT 370, 3270 PC, and 8150 (level 6). In fact, IBM stated at the press conference that it has "nearly realized its 1980 statement of intent to link office systems."
- While only a brief summary of the total October workstation announcement will be attempted, it is extremely important to put the announcement in proper perspective. The announcement was an SNA announcement and not a PC announcement; thus it must be viewed in the context of the total architecture depicted in Exhibit III-1.
 - The 8100 should be written up as a future case study. INPUT's view has always been that the 8100's primary purpose was to act as a cluster controller (see INPUT's report, Impact of the 8100, March, 1979) that could replace the 3790 (which was a disaster). The 8150, despite new technology (bipolar logic chips) and architecture (diadic processing) is still intended primarily as a super (and expensive) controller. However, it now has a role to play in the integration of various office systems.
 - Both DPPX/SP and DPCX (the 8100's operating system) were substantially enhanced with the announcement, and if you are

into doing your own thing you may now have a processor and software to support your efforts.

- The enhancement of the Distributed Office Support System under DPCX (DOSF) provides: ability to integrate text and data (from the host), exchange and editing of documents between any Displaywriter or 5520 Administrative System and an 8100 office workstation, and "more flexible text, record, math, and archive processing."
- Of course, the Distributed Office Support System for the Displaywriter and 5520 Administrative System programming (DISOSS) were also enhanced in order to accomplish the integration, but the 8100 series serves as the focal point.
- It does not appear that the 8100 is going to die, and it staggers the imagination to realize that you can now get up to six megabytes of memory on the 8150 (at a cost of \$145,000).
- The Personal Computer XT/370 is certainly enough to excite anyone who wants to speculate about what can happen in the future.
- By adding three circuit cards the following was accomplished:
 - A processor card containing three microprocessor chips (two based on the Motorola MC 68000 and one on the Intel 8087) permits the execution of the System/370 instruction set.
 - A memory card provides an additional 524,288 bytes of storage (up to four million vertical for interactive computing in the VM/PC mode).

- The third card provides for a coaxial attachment that enables the processor to act as a 3277 Model 2 terminal when connected to a host through the IBM 3270 display control unit.
 - The XT 370 is supported under VM/PC, and while this control program provides only CMS functions at present, the very nature of VM implies the flexibility to add other operating systems, and it can be assumed that this will be done.
 - Look for offloading of mainframes (for both application and program development) to be used as cost justification for the purchase of XT 370s, but don't look for decreased workload on the central hosts - it probably is not going to happen.
- The IBM 3270 Personal Computer does not require looking under the covers to appreciate it; the "gee whiz" aspect can be viewed in living color through seven "windows" on a single screen. Four windows can be used to display data from host processors, two can be used as electronic notepads, and one can be used for the personal computer itself. The windows can be rearranged and displayed in different fashions, and information on the screen can be processed, printed, or exchanged between windows.
 - It appears that a great deal of thought has gone into the development of the professional workstation; such a workstation has many attractive features and a great deal of flexibility. However, design of specific applications still requires a great deal of care, and the human factors associated with such a busy screen may prove surprising.
 - Very attractive is the ability to tie into multiple hosts (for example, levels 3 and 5 in Exhibit III-1), the ability to receive messages from other locations, and the ability to use a personal computer.

- Attachment of the 3270 PC to the existing IBM 3279 Color Display Station was also announced, but considering current concerns about the footprint of office systems on a disk, this announcement may have limited appeal.
- Thus, the October announcements address distributed processing and distributed data/information bases via both hardware and software.
 - The ability to move data and information up, down, and across the network is going to improve office communications substantially.
 - In addition, there will be sufficient processing power at the workstation to process data in a high percentage of commercial applications.
 - Altogether, this was an exciting announcement, but past experience has shown that exciting new hardware/software systems require careful analysis and planning if potential advantages are to be achieved.
- Ease of use remains the key to improving office systems' productivity. INPUT has concluded that the knowledge-based systems that have begun to be developed out of research in artificial intelligence are logical extensions of today's data and information-based systems. It should be noted that IBM saw fit to announce the availability of INTELLECT (from Artificial Intelligence Corporation) at this time. More such tools will be required as office automation proceeds.
- It should be understood that while most recent announcements support some integration of existing IBM office products, the announcements are directed primarily toward distributing processing power and host data into the office.

The fundamental paper-based systems of most offices have not been directly addressed. However, approximately one year ago IBM did announce Scanmaster/I (Exhibit III-1, level 7), which is an initial effort in image processing. Scanmaster/I can be viewed in two ways (this was discussed in some detail in INPUT's Executive Bulletin/Hardware Operations, Volume 1, Number 1): Planning Implications of the IBM Scanmaster and 3725.

- As an improved facsimile system for rapid communication of charts, drawings, handwritten or typed letters, and forms.
- As an electronic filing system for such documents, where they will be stored for later retrieval and/or printing within the office.
- It is INPUT's opinion that elimination of paper in the office is a primary factor in improving office productivity, but that this will require an enormous amount of on-line storage at the nodes.
- Therefore, we come to level 8 (Exhibit III-1) and will find requirements for local storage that will parallel those of level 1 but also include personal data bases on the intelligent workstation. In this connection, the Optimem 1000 was announced.
 - It is a 12-inch optical disk, holding one gigabyte. The optical drive sells for \$6,000 in quantities of 250, with an additional price tag of \$1,500 for an electronic controller.
 - Unlike the STC drive mentioned previously (which sells for \$130,000 for four gigabytes), the Optimem drive is aimed at the micro and minicomputer worlds - in other words, at the office.
 - While the Optimem announcement does not anticipate integrated systems being available until 1985, Optimem will start making OEM shipments in the first quarter of 1984.

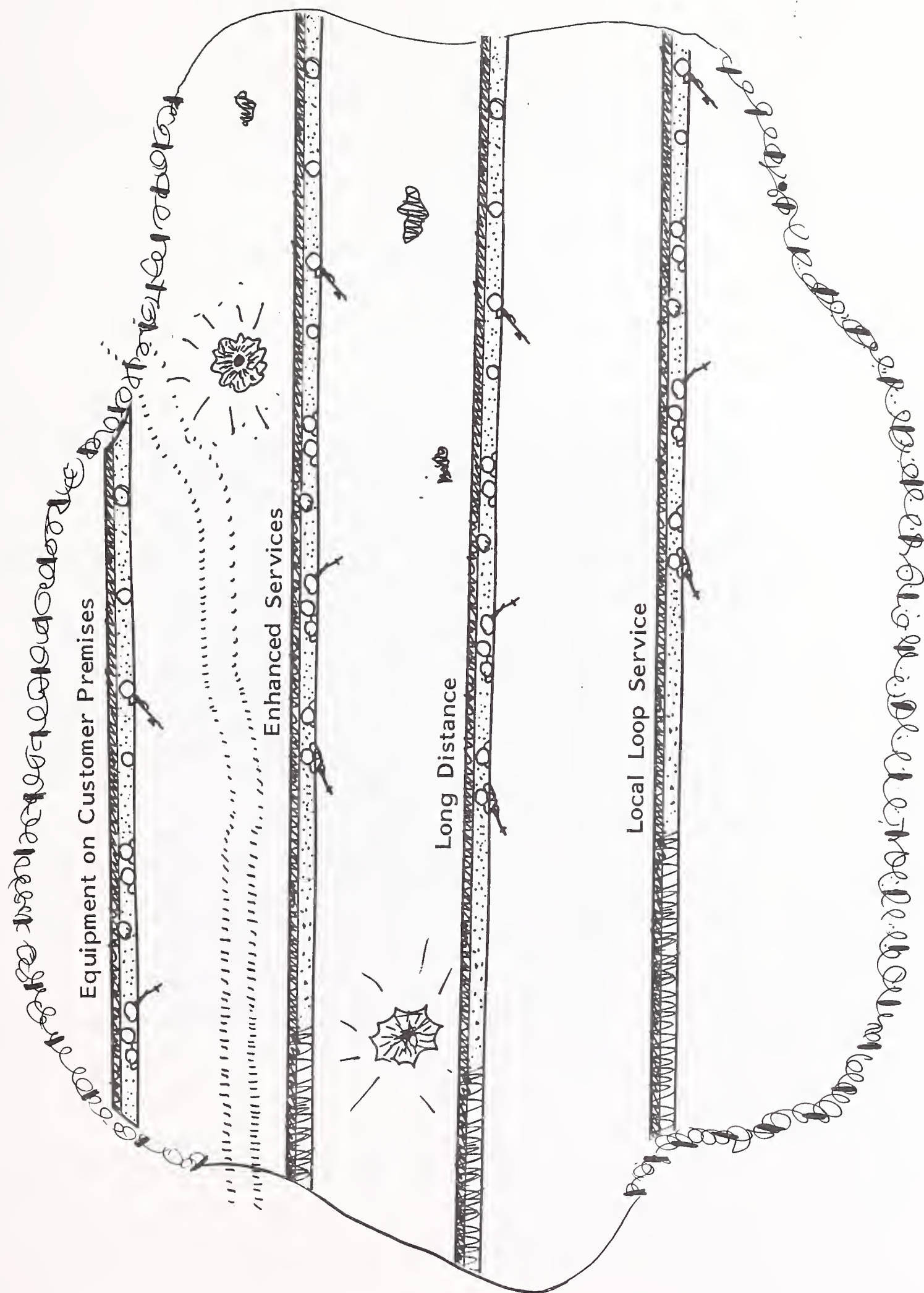
- It appears that the hardware and software to effect substantial changes in office systems is rapidly falling into place. It is rumored that IBM will demonstrate a LAN in Geneva, Switzerland in the near future, and improved office products can be expected on practically a monthly basis over the next few years. In order to achieve improved office productivity, a great deal of good, old fashioned systems work is going to be required in order to incorporate all the new technology. It remains INPUT's opinion that the information systems department must exercise the leadership in this office revolution if it is to be successful.

2. COMMUNICATIONS TRENDS

- There are many exciting technological changes that will be affecting communications (both voice and data) in the remainder of the 1980s. These include:
 - Cellular radio.
 - Voice compression.
 - Fiber optic trunks.
 - Inexpensive satellite receiving technology.
 - Local digital microwave.
- In addition, there is the opportunity for many more competitive vendors in communications markets.
 - Deregulation has made MCI and the other "common carriers" even more competitive.

- At least 200 long-distance resellers have been spawned by anomalies in the regulation process (although these loopholes are closing).
- Corporations have announced the marketing of their private network resources (e.g., Penney's, International Harvester, NCR).
- However, rather than facing a new dawn of communications, we may instead be heading back, not just into the fog of regulation but, even worse, into the miasma of politics.
- This is ironic, since it was originally believed, by those who did not understand the governmental process, that the deregulation of most of the communications business would reduce interference in communications activities. This might possibly be true in the long run, but will definitely not be so in the next several years.
- The FCC appeared to have believed that it would be possible to deregulate enhanced communications services while keeping basic telephone services essentially regulated.
- However, the resolution of the AT&T antitrust suit moved the communications battlelines, as shown in Exhibit III-2, by essentially freeing long-distance communications as well (with the exception that AT&T must still show that its rates are economically justifiable).
- However, in a free market this would mean that the historic cross-subsidization of local service from long-distance service would no longer be possible, and this would place an extra burden of perhaps \$10 billion on local phone rates.
- In the world of pure economics this cross-subsidization would be a "wash" since telephone users, as a group, would be no worse off and probably better off than before.

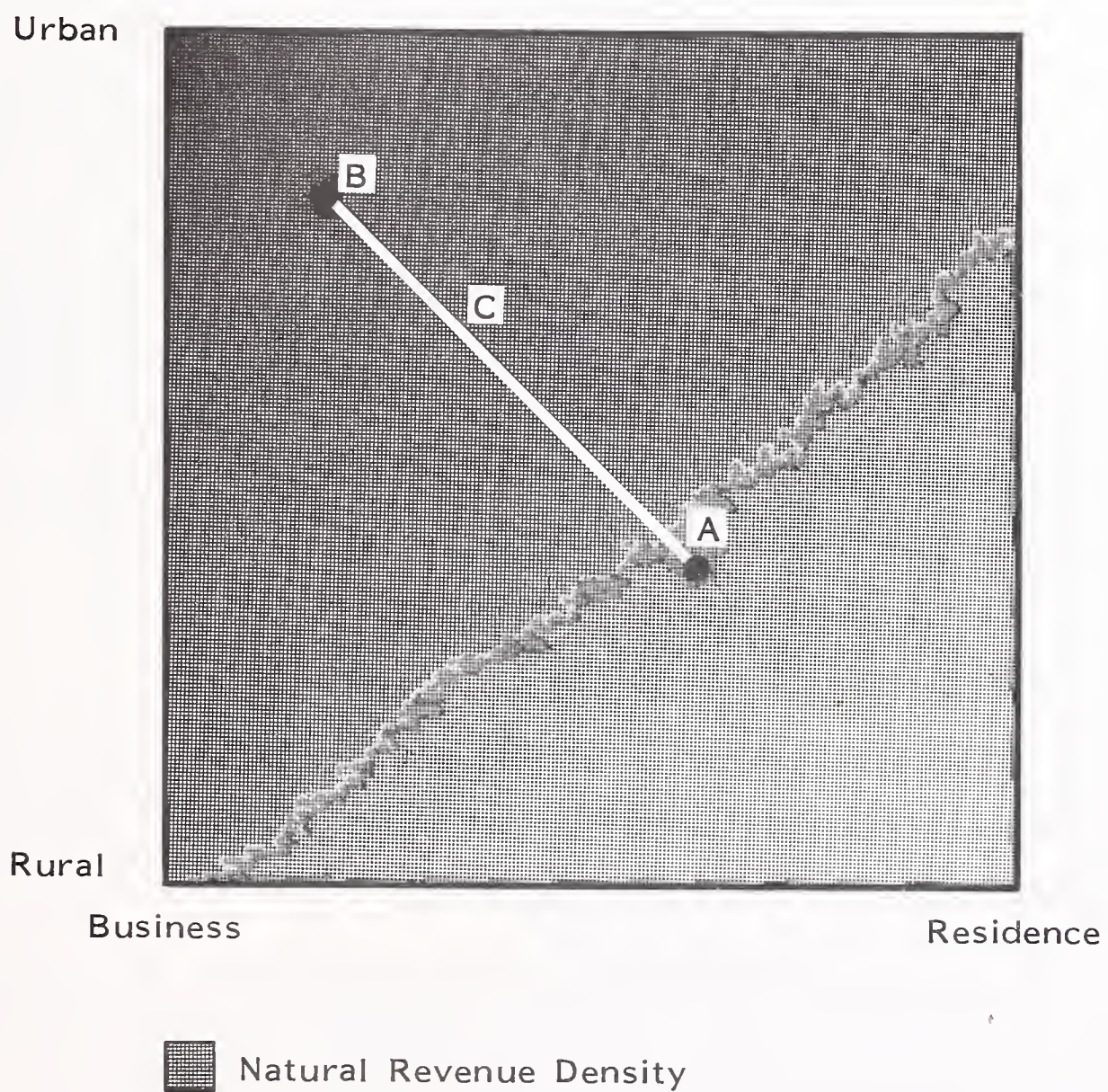
THE BELL MONOPOLY RETREAT IN THE COMMUNICATIONS BATTLEFIELD



- However, in the real world, higher telephone bills would be paid by most residential customers (i.e., voters) - especially those in rural areas (which have a disproportionate representation in the U.S. Senate).
 - In Exhibit III-3, Point "A" is a representation of the current, regulated effects of cross-subsidy; revenue is redistributed away from its "natural" patterns.
 - Cost-based, competitive long-distance service would move revenue toward "B." Nonurban or business users would have to pay considerably more.
- While justifiable in the abstract, this subsidizing plan is not politically feasible; too many disadvantaged people would be affected.
 - The FCC has proposed that monthly access charges be instituted that would move the center of gravity back to about "C" (see Exhibit III-3). The FCC is hoping that the state regulators will accept the same level of charges for the individual states.
 - Many of the states are unlikely to do this in 1984, an election year. They are likely to propose much higher charges for business access to the intrastate toll network.
- Consequently, 1984 should see intrastate and interstate toll charges that are even more skewed than before; this will be the opposite of one of the original intents, which was to standardize rates among the states.
 - Congress itself has not yet been heard from. It has been hoping that the courts and the FCC will take care of this issue, since whatever action is taken, politically powerful interests will be offended.

EXHIBIT III-3

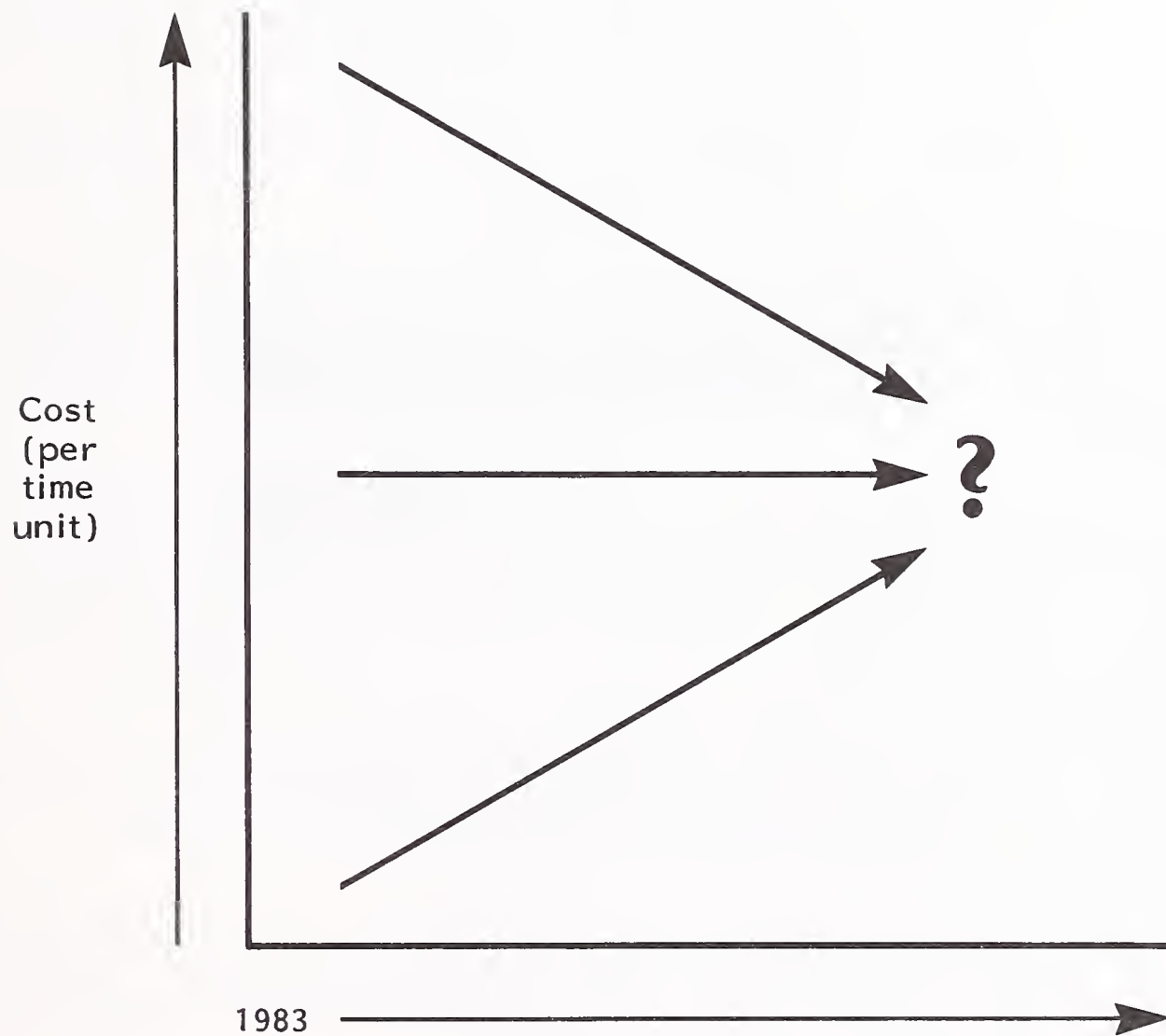
POTENTIAL REALLOCATION OF COMMUNICATIONS REVENUES



- However, with states setting the lead for returning the burden of communication subsidies to business, Congress will be hard-pressed to avoid similar steps.
- The result may well be a communications structure that is even more skewed and unfriendly to commercial use of the public communications network.
 - Rather than toll calls subsidizing local calls, as in the past, business will subsidize residential service; once this principle is established it will be very difficult to change.
 - Cost-based rate-setting for AT&T's long-distance service will narrow the price gap between WATS and direct-dial service, as shown in Exhibit III-4.
 - Similarly, leased lines will come down in price. In turn, resale will become less attractive and private networks will be encouraged.
- All players will be returned to square one or, more precisely, square minus-one.
 - AT&T's competitors will have been weakened.
 - There will be fewer economic incentives to improve the technical productivity of the long-distance network, since for the first time the subsidy will no longer mainly stay within the Bell System.
 - Corporations will have very strong reasons to leave the public network whenever possible. Prices will increase at some unforeseeable (because political) rate and service quality will probably decline.
- However, if private networks are established, they will almost certainly be "taxed" so that they will have to pay their share of the residential subsidy.

EXHIBIT III-4

COMMUNICATIONS COST CONVERGENCES



- This tax would almost certainly be "ex post facto" and would include current private networks.
- Despite this volatile background, IS management is still reluctant to change from Bell networks for data communications.
 - Exhibit III-5 shows that current Bell users will decrease their use of Bell services for data transmission in the next three years by 24%.
 - Exhibit III-6 shows that the use of Bell alternatives will grow by about 70% from a relatively small base.
- The IS department must become more involved with the changing telecommunications industry. The rules are changing and old assumptions no longer apply.
 - IS will do more network planning. The Bell-provided network management services will still be available, but for a fee; this fee will be insignificant.
 - Non-Bell vendors will provide many more services, but the risk associated with new services and vendors will also be present.
 - The economics of the dictated current data communication topologies may no longer apply. Change is expensive, but no change may even be more costly to the organization.

EXHIBIT III-5

BELL NETWORKS' USE WILL DECREASE
IN THE NEXT THREE YEARS

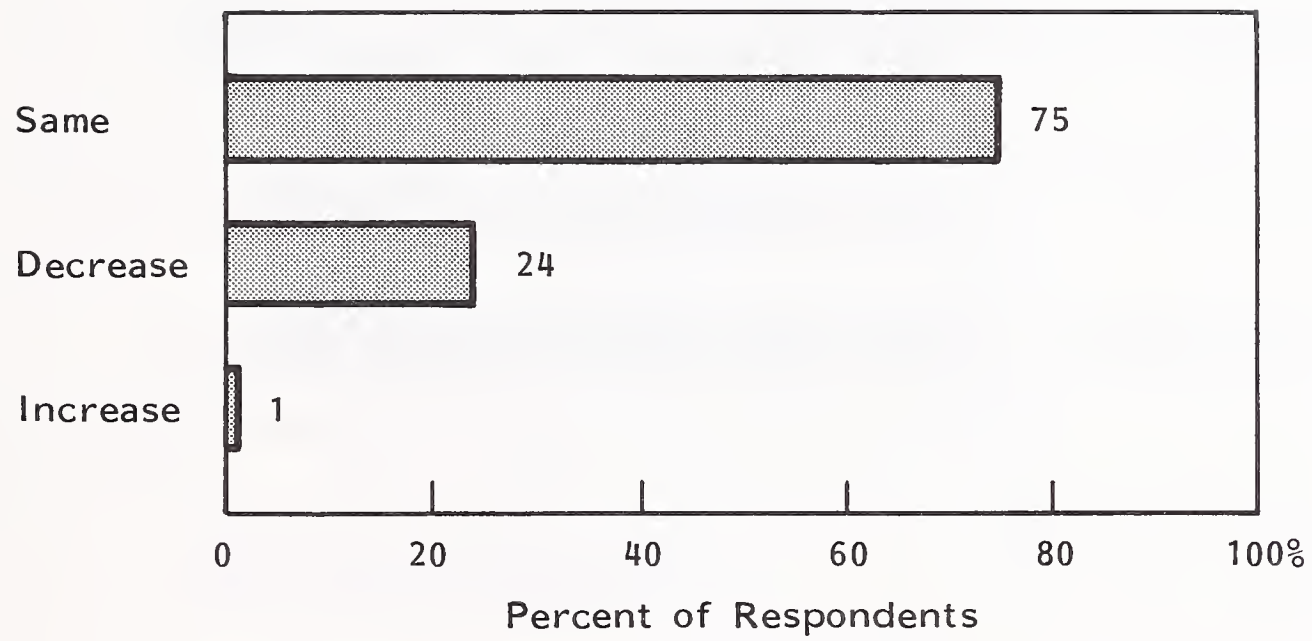
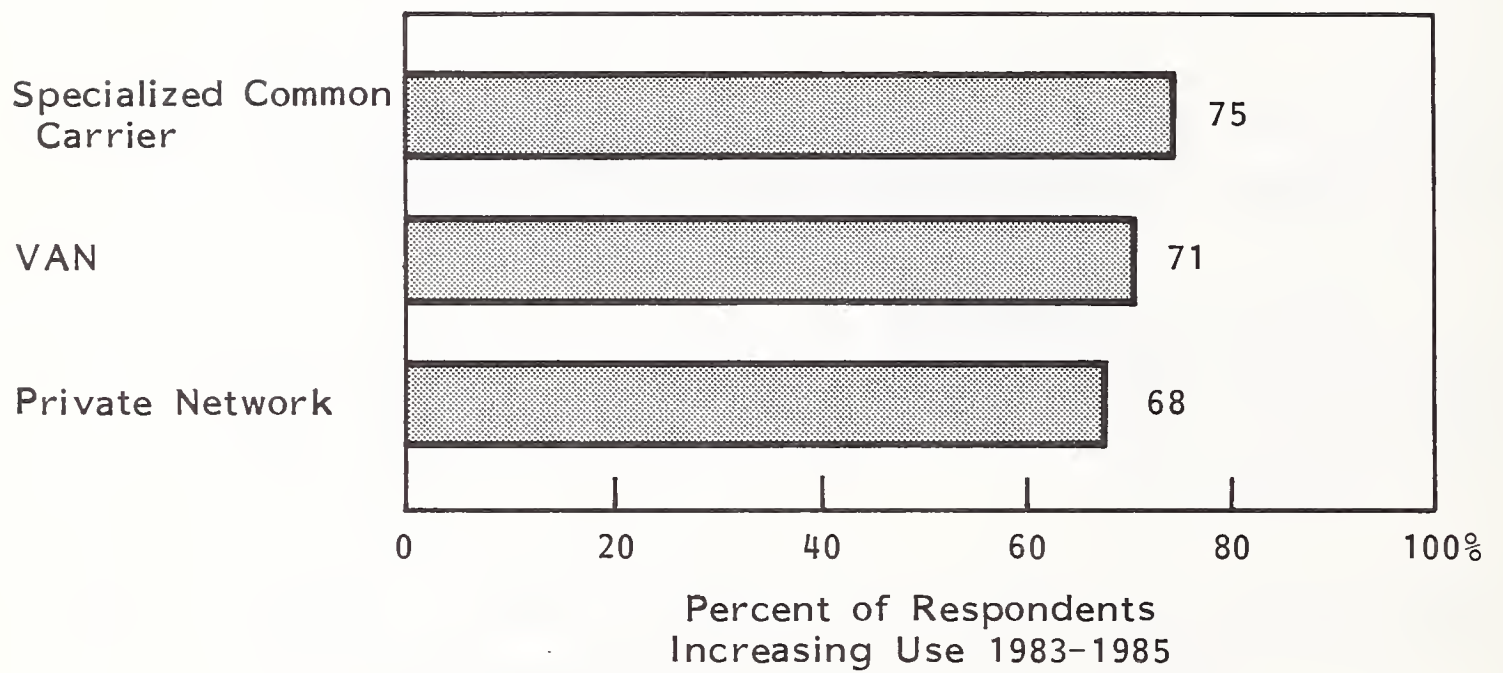


EXHIBIT III-6

BELL ALTERNATIVES WILL INCREASE



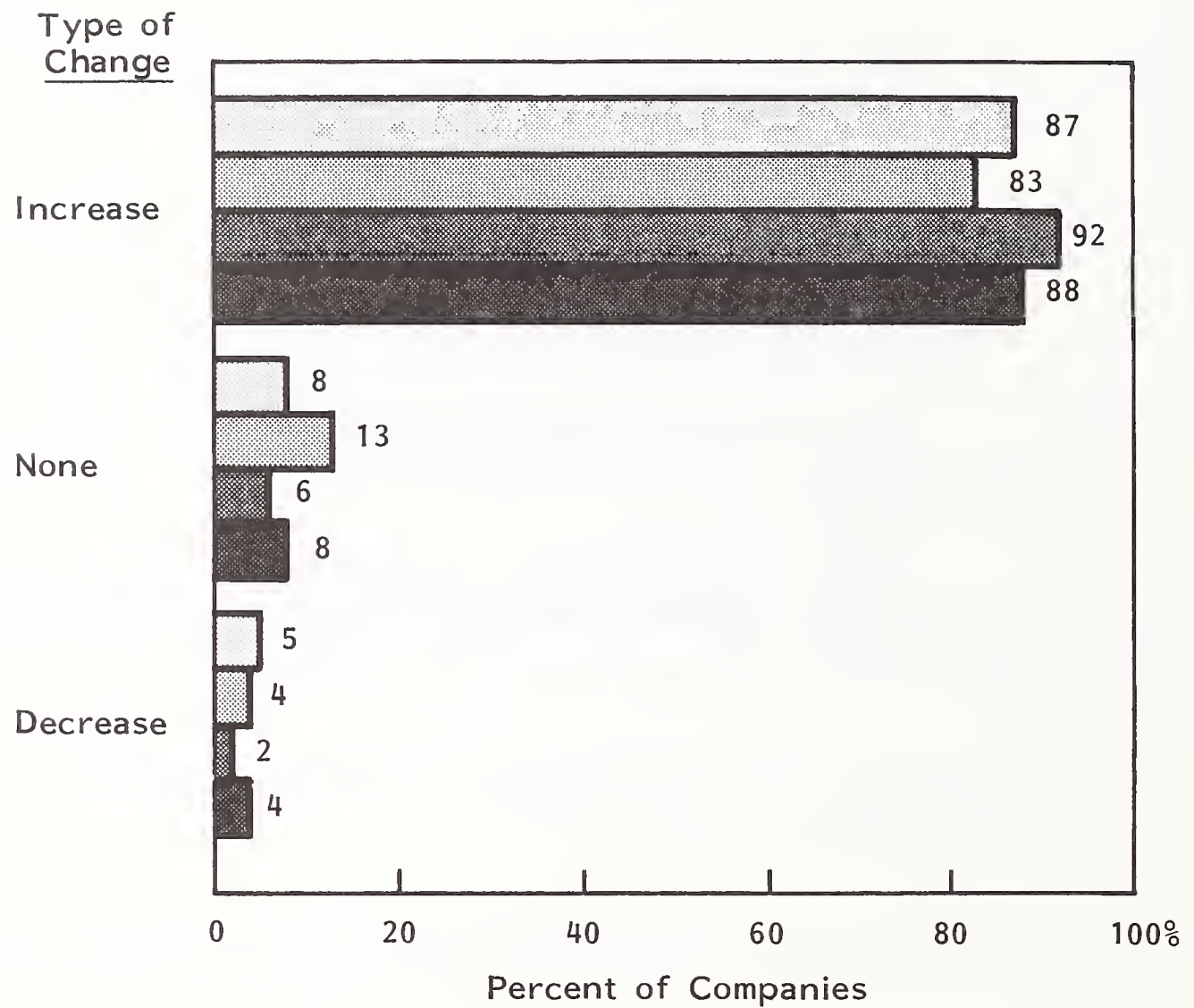
C. ANNUAL SURVEY FINDINGS

I. INFORMATION SYSTEMS BUDGETS





- Most of the firms surveyed expected to see an increase in their IS budget in 1984, as shown in Exhibit III-7. Overall IS budgets will increase 7%.
 - For most of the firms the alternatives to an increase is no change, i.e., keeping the same budget as in 1983.
 - The size of the firm had major bearing on whether budgets increased.
- The average rates of budget change vary considerably by sector. The overall average is 7%, as shown in Exhibit III-8. Values range from a low of under 5% for process manufacturing to almost 12% for utilities. This reflects events occurring in each sector.
 - Because of the oil glut, process manufacturing (e.g., chemicals, oil) has seen a significant drop in overall business in 1983.
 - Utilities are recovering from the recession and are "catching up" from past budget stagnation.
- All sectors except the following three expect a drop in budget increases for 1984:
 - Transportation, whose rate of growth had already declined in 1982.
 - Services, much of whose growth is fueled by the computer service industry itself.

EXHIBIT III-7

ANTICIPATED BUDGET CHANGES FOR 1984, BY COMPANY SIZE



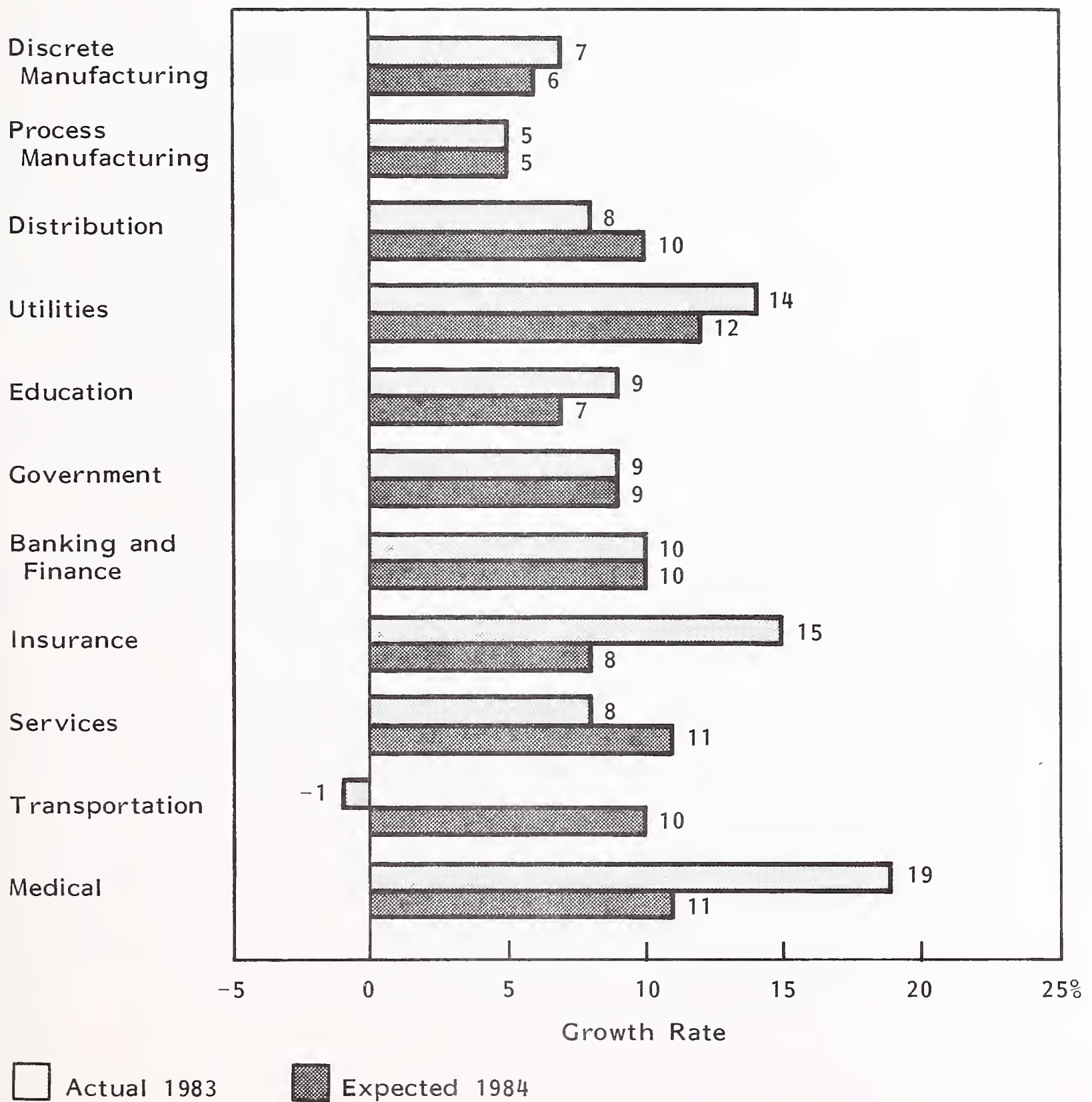
Key:

-  Under \$250 million
-  \$250 million to \$1 billion
-  Over \$1 billion
-  Total

SOURCE: INPUT Surveys

EXHIBIT III-8

INDUSTRY I.S. BUDGET GROWTH



- Distribution, which is gearing up for the use of point-of-sale and fully automated inventory systems.
- Not all budget categories will be growing at the same rate. Spending on personnel is expected to grow 5%, while the spending rate increase on personal computers will be almost three times as high, as shown in Exhibit III-9.
 - Microcomputer spending will, in fact, be growing at a even higher rate since so much of it is taking place outside of the IS department.
 - Software, communications, and outside processing are other areas expecting higher than average growth.
 - Integrated systems is the only area in which expenditures are expected to decline.
- Firms spend an average of about \$1,800 on IS for every corporate employee, as shown in Exhibit III-10. There are wide variations by industry sector, however.
 - Distribution, government, and education spend appreciably less, reflecting the low levels of automation in these sectors.
 - Insurance, banking/finance, and services spend much more than average, reflecting both their long-standing automation, as well as, in the case of insurance, the distribution network not being part of the corporate entity in most cases. The high spending per employee is especially present for information systems service companies where an average of over \$38,000 per employee is spent. These organizations also have an extremely high ratio of IS employees to total employees. In many cases the entire staff is composed of IS personnel.

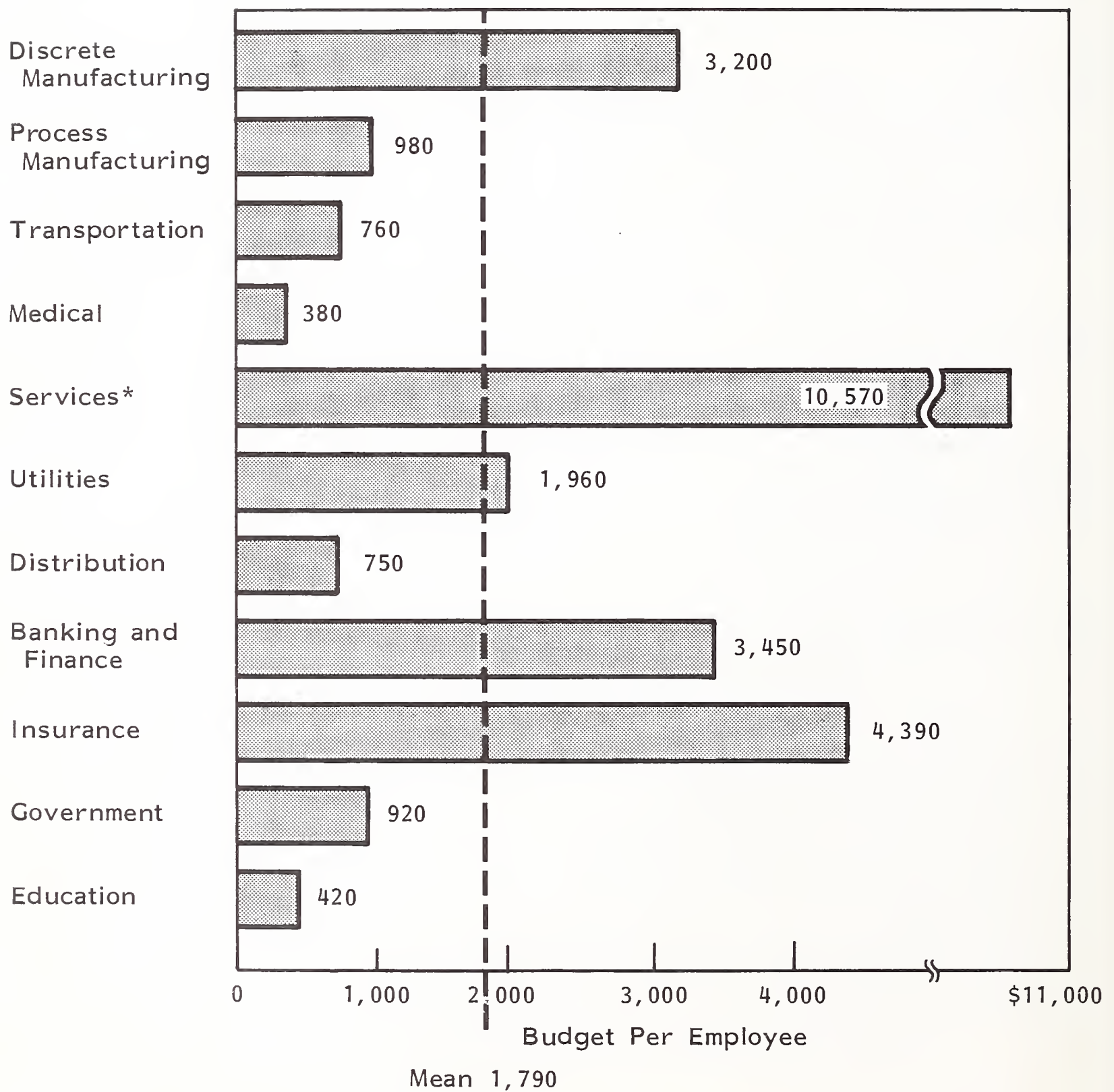
EXHIBIT III-9

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	43.0%	5.3%
Mainframe Processors	9.9	4.1
Minicomputers	4.4	7.9
Micro-personal Computers	2.9	14.3
Terminals	3.6	4.9
Peripherals	6.6	3.7
Total Hardware	27.5%	5.3%
Communications	7.6	6.8
External Software	3.6	6.5
Custom Programming	3.4	7.7
Integrated Systems	0.2	(0.2)
Total Software	7.2	6.6
Software Maintenance	1.9	6.4
Hardware Maintenance	3.5	5.6
Total Maintenance	5.5%	5.9%
Outside Processing Services	3.3	10.9
Other	5.9	4.9
Total	100.0%	7.2%

EXHIBIT III-10

1983 BUDGET PER EMPLOYEE



* Non Information Service Companies = \$3,400 per employee
 Information Service Companies = \$38,797 per employee

- Budgeting conventions will become even more of an issue in future years, as end-user computing increases in importance and users assume more direct control of computing budgets.

2. INFORMATION SYSTEMS PLANNING ISSUES

a. Issue Types

- There are two major types of issues that affect IS plans:
 - Problems.
 - Objectives.
- "Problems" are self-explanatory; they may be internal or external, technical or managerial.
- "Objectives" are the goals that IS is heading toward. An objective may exist because of a problem (e.g., improvement of user relations) or may exist in the absence of a precipitating problem (e.g., development of an office automation plan).

b. Issue Groups

- There are many IS issues. For purposes of analysis and presentation, issues have been grouped into three major areas and seven subgroups. Exhibit III-11 shows these areas and subgroups, along with examples.
- Several of the major subgroup issues are separately reported and analyzed in the individual industry sector analyses in Chapter IV.

EXHIBIT III-11

INFORMATION SYSTEMS ISSUE AREAS AND GROUPS

ISSUE AREA	ISSUE GROUP	EXAMPLES OF SUBGROUPS
Corporate Relationships	Same	Relations with upper management, relations with users, company objectives, committees
IS Management	Planning and Control	Applications planning, backlog, project control, management techniques, organizational changes
	Personnel	Shortages, turnover, training, recruitment
	Costs	Budget cuts, budget justification
Technical	Hardware	Operation, capacity management, maintenance, DDP security
	Software	Development, maintenance, productivity, quality, packages
	Telecommunications	Data and voice networks, equipment planning
	End-User Computing	Office systems, personal computers, information centers

c. Methodology

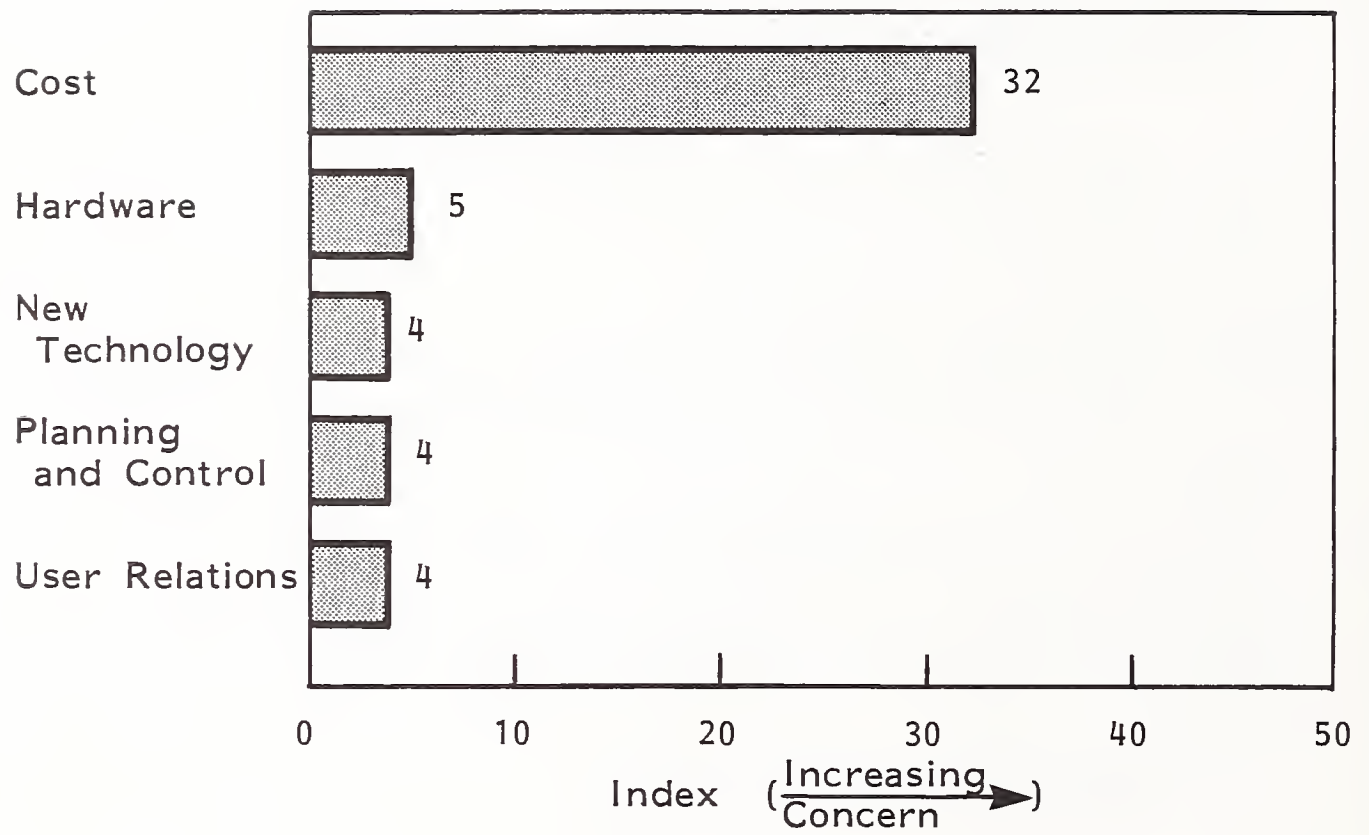
- Survey respondents supplied open-ended responses to questions about what they saw as the most important problems and objectives facing their organizations. Respondents could, in order of importance, supply as many as three issues in each category. The answers were later coded into groups and subgroups for further analysis.
- Weights were assigned to the responses. Each weight was multiplied by the number of responses to compute a "raw score" for each subgroup. Then raw scores were accumulated for all companies and each subgroup's raw score was normalized based upon the total raw score.
 - Each subgroup's raw score was calculated as a percentage of the total raw score.
 - For each industry sector, a similar calculation was made that reflects the relative importance of the issue group within that sector.
- These subgroup percentages have been added together to obtain an index value for an issue group. For example: Some IS departments have problems with both users and upper management; others have problems only with users.

d. Senior Management Concerns

- The most significant area of concern to senior management is cost.
 - The senior manager is defined as the person that the head of the IS department reports to.
 - Not surprisingly, costs and the tangible component of costs (hardware) are the top concerns. Exhibit III-12 shows the top five senior management concerns. Cost is over six times as significant as the issues mentioned.

EXHIBIT III-12

SENIOR MANAGEMENT CONCERNS



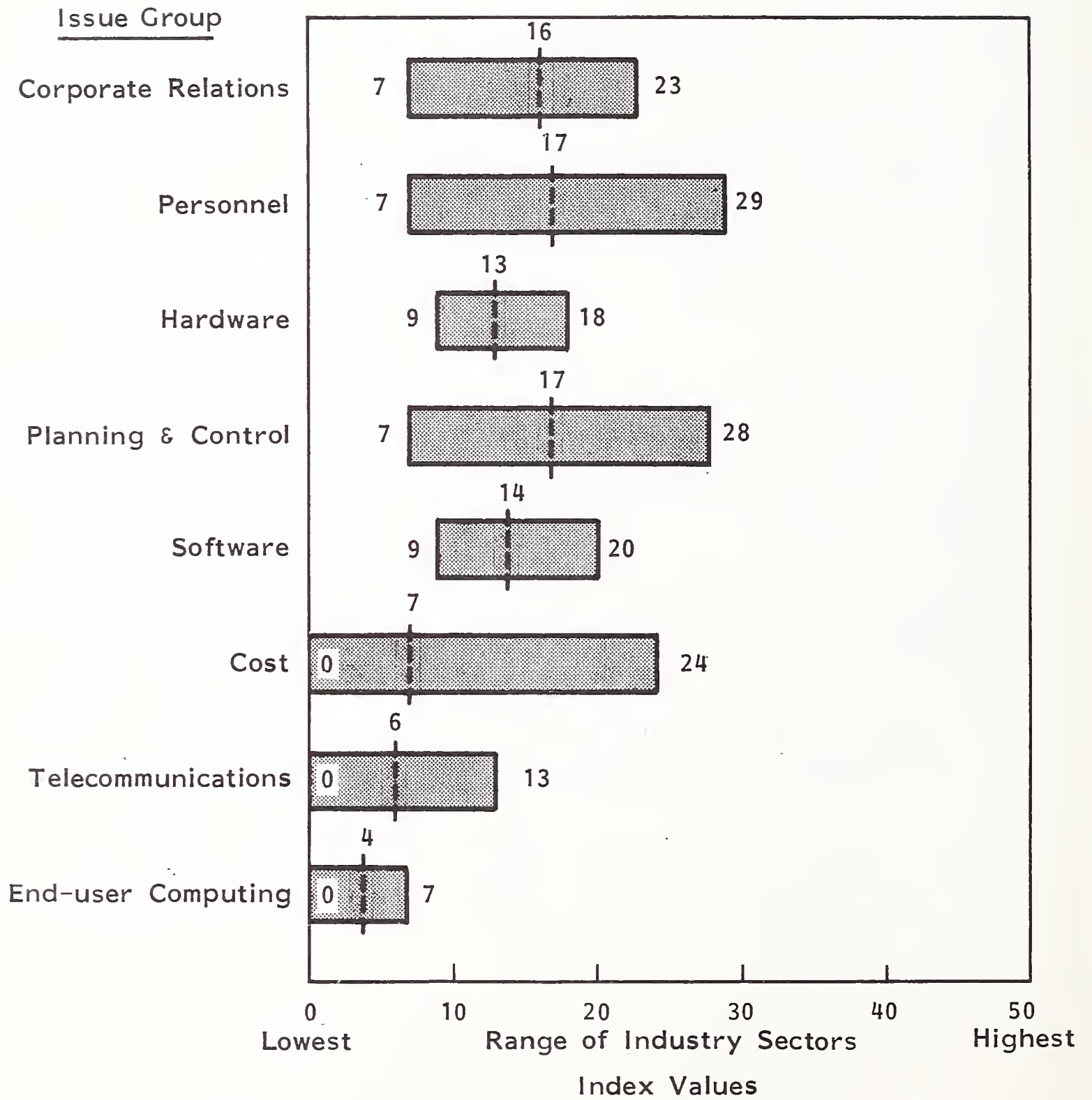
- In the following sections, IS management's concerns and objectives are analyzed. Cost is not directly addressed by IS management through its objectives, nor is it perceived as a top problem. This inconsistency between the concerns of senior management and IS management may be the source of many of the conflicts that arise between these two groups.

e. Information Systems Problems

- For all organizations, the relative importance of the problem groups is similar, as shown in Exhibit III-13.
 - However, there are usually quite large variations in relative importance from sector to sector.
 - Costs, telecommunications, and end-user computing are not considered to be major problems. (Although, as will be seen, considerable importance is placed on telecommunications/office automation as objectives.)
- Exhibit III-14 shows the actual problem index values for all organizations and each industry sector.
- Company/division size in some cases does have an impact on the relative importance of problems, as shown in Exhibit III-15.
 - Large companies, not unexpectedly, have significant problems with corporate relationships. They have fewer perceived problems in software and cost-related issues.
 - Large companies also have relatively more problems in telecommunications and end-user computing. These problems arise because of the company's organizational complexity and its position on the leading edge of the industry.

EXHIBIT III-13

RELATIVE IMPORTANCE OF INFORMATION SYSTEM PROBLEMS



SOURCE: INPUT Surveys

EXHIBIT III-14

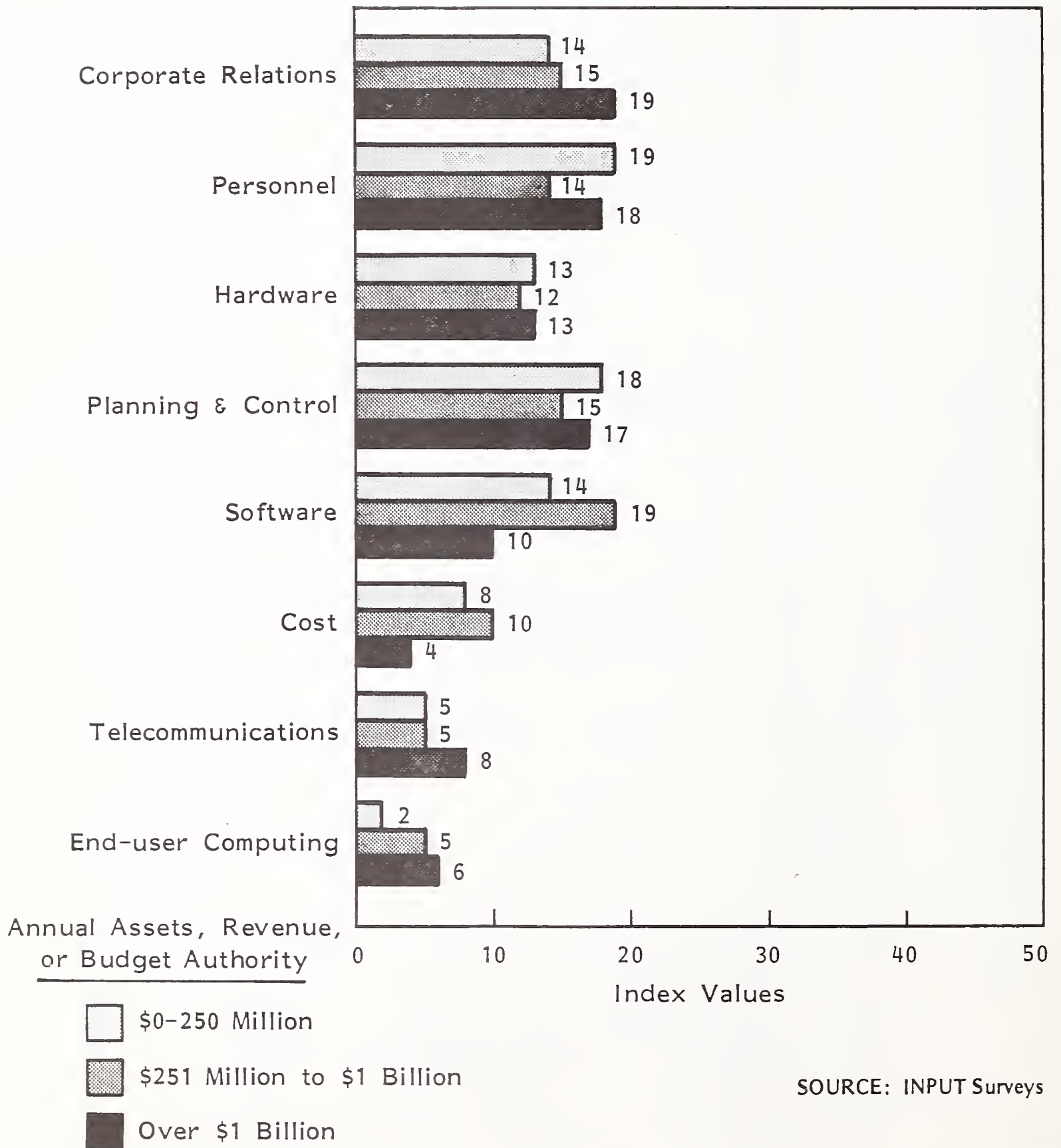
RELATIVE IMPORTANCE OF INFORMATION SYSTEMS PROBLEMS, BY INDUSTRY SECTOR (Index Values)

	CORPORATE RELATIONSHIPS	PERSONNEL	HARDWARE	PLANNING AND CONTROL	SOFTWARE	COSTS	TELE- COMMUNICATIONS	END-USER COMPUTING
DISCRETE MANUFACTURING	14	18	11	17	20	8	4	1
PROCESS MANUFACTURING	19	17	9	12	13	9	4	7
TRANSPORTATION	7	7	10	25	18	5	13	5
UTILITIES	9	16	18	15	9	7	6	6
BANKING AND FINANCE	13	12	17	21	17	1	9	4
INSURANCE	14	23	13	28	10	7	3	0
DISTRIBUTION	23	13	14	21	10	2	9	1
SERVICES	18	22	16	9	12	5	5	5
GOVERNMENT	21	21	16	7	16	1	3	6
EDUCATION	10	29	9	9	9	24	7	3
MEDICAL	17	20	10	27	17	0	0	0
ALL	16	17	13	17	14	7	6	4

NOTE: The larger the index values, the greater the importance.

EXHIBIT III-15

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS, BY COMPANY SIZE



SOURCE: INPUT Surveys

- Medium-sized companies, in contrast, are caught in a bind on software and cost issues.

f. Objectives

- Objectives are quite similar to problems, except in the areas of personnel, planning and control, and software and end-user computing. Details are shown in Exhibits III-16 and III-17.
- Personnel problems are not usually included as formal objectives in most companies. This is in part due to the low priority assigned to personnel issues and the difficulty of achieving the few objectives that are established.
 - Reduced turnover may be easily measured but difficult to achieve.
 - Increased training of personnel is laudable but unfortunately a low-priority objective.
- Planning and control problems are usually remedied by objectives from other issue groups. Reducing backlog usually involves increasing staff or increasing productivity (through software development tools or different hardware configurations).
- Software and end-user computing are in the opposite position of having objectives that are considered to be more important than related problems.
 - Software is an action area for most companies. Note in Exhibit III-18 how important software-related objectives are to medical and insurance sectors.
 - In end-user computing, companies are attempting to take a planning role in an issue area that is relatively new in most companies. The

EXHIBIT III-16

RELATIVE IMPORTANCE OF INFORMATION SYSTEMS OBJECTIVES

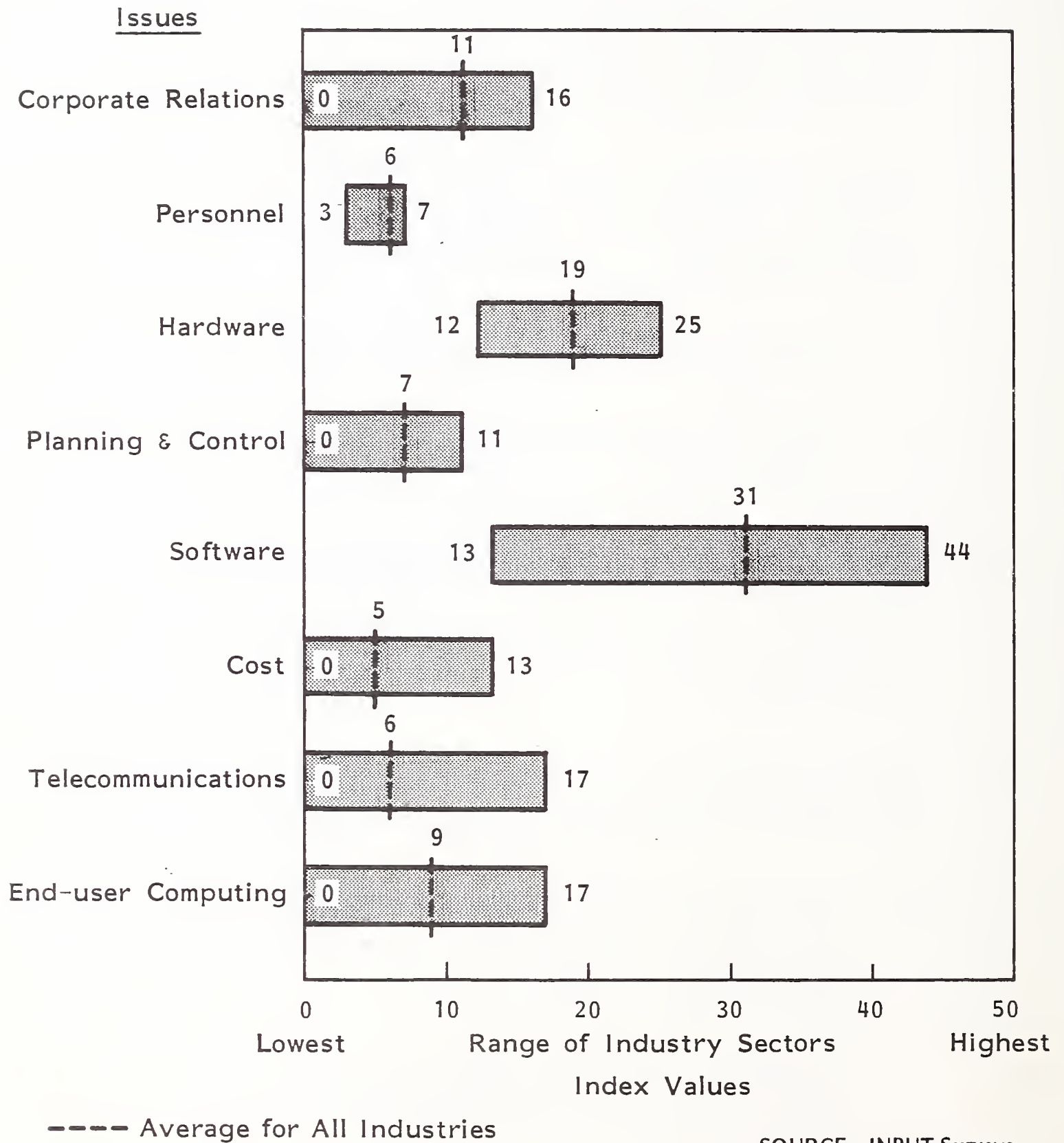


EXHIBIT III-17

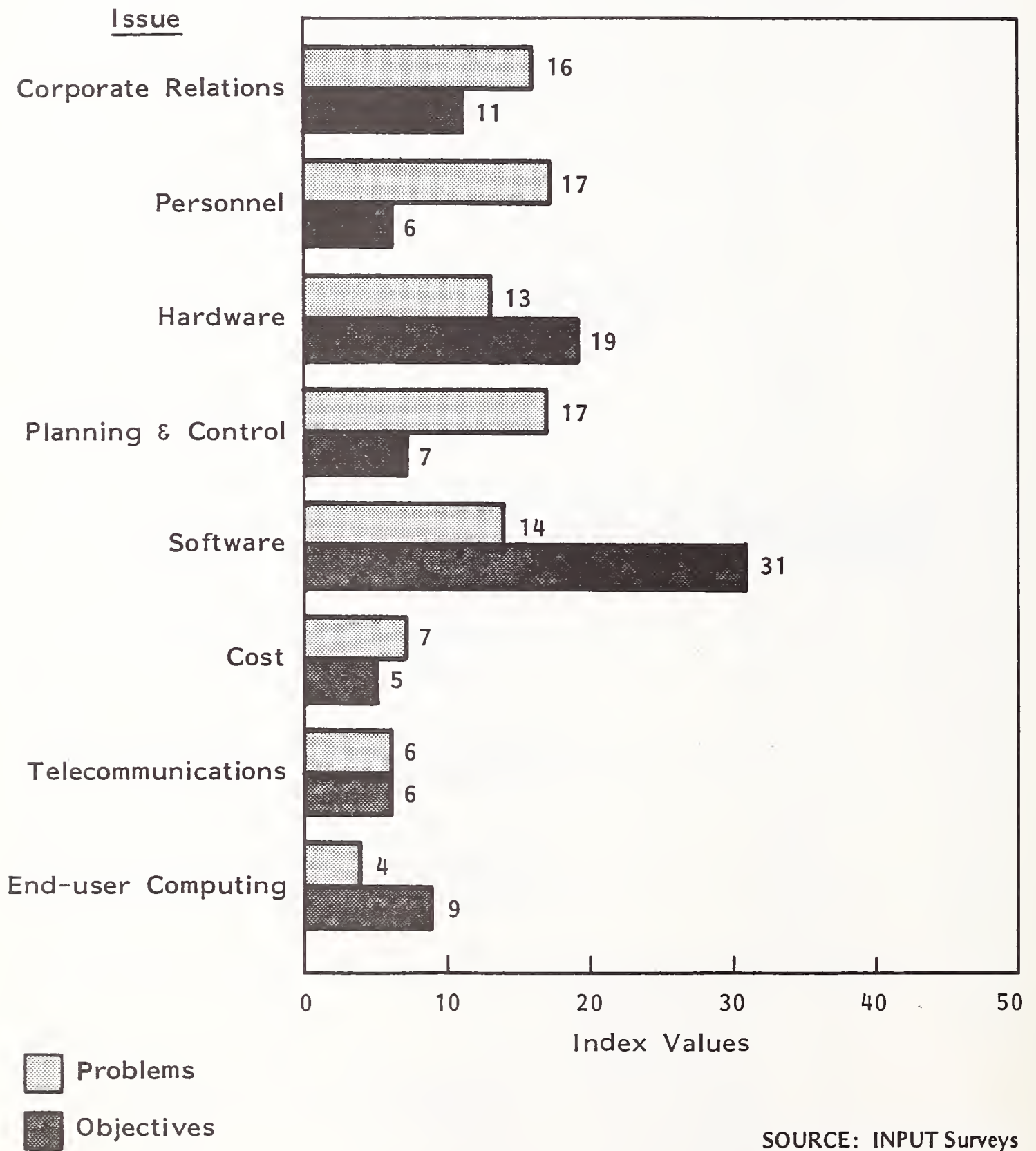
RELATIVE IMPORTANCE OF INFORMATION SYSTEMS OBJECTIVES, BY INDUSTRY SECTOR (Index Values)

	CORPORATE RELATIONSHIPS	PERSONNEL	HARDWARE	PLANNING AND CONTROL	SOFTWARE	COSTS	TELE- COMMUNICATIONS	END-USER COMPUTING
DISCRETE MANUFACTURING	15	6	16	9	34	3	6	6
PROCESS MANUFACTURING	13	6	12	9	38	5	3	7
TRANSPORTATION	10	7	23	4	30	10	11	4
UTILITIES	9	10	19	11	33	0	6	6
BANKING AND FINANCE	12	7	17	11	22	5	8	12
INSURANCE	4	7	14	8	44	13	2	7
DISTRIBUTION	16	3	25	4	34	3	4	12
SERVICES	15	8	19	6	26	10	6	4
GOVERNMENT	6	5	30	6	18	2	14	13
EDUCATION	12	2	28	0	13	6	17	16
MEDICAL	0	3	25	8	43	0	0	17
ALL	11	6	19	7	31	5	6	9

NOTE: The larger the index values, the greater the importance.

EXHIBIT III-18

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS VERSUS OBJECTIVES (All Companies)



newness affords the opportunity to manage end-user computing before it pervades the organization. The specter of uncontrolled end-user computing is a latent problem that is being anticipated.

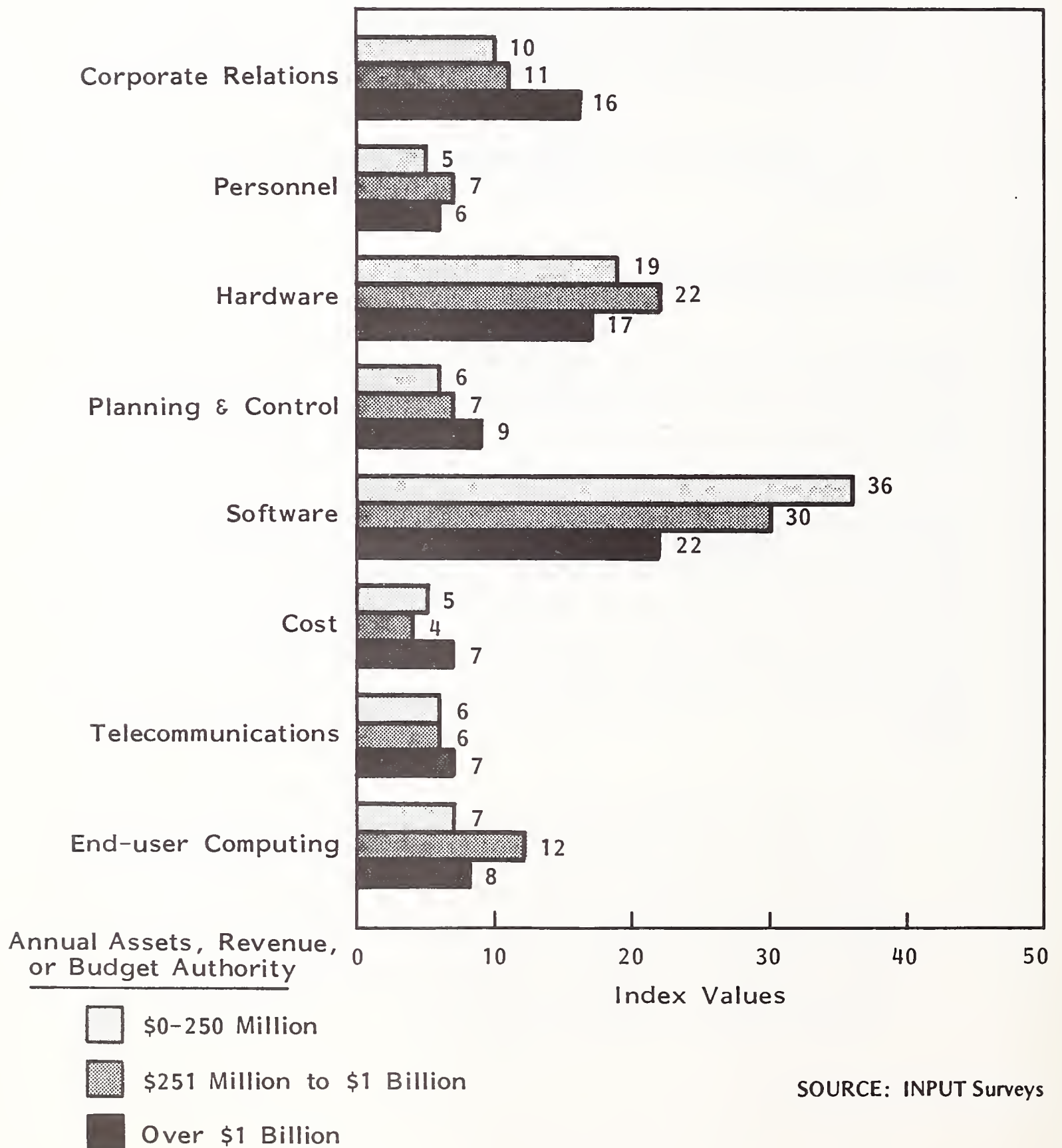
- The relative importance of company objectives varies with company size, as shown in Exhibit III-19.
 - Large companies place greater importance on management-related issues such as corporate relationships, planning and control, and cost.
 - The objectives of medium and small companies focus on technical issues.

3. APPLICATIONS DEVELOPMENT

- Applications development is still fighting a losing battle against backlog. Users are now taking a direct role in satisfying their computing needs by using personal computer and information centers (see section C.4 of this chapter).
- Some of the productivity advancements that are being used by end users are becoming accepted by IS departments. Fourth-generation languages are being used not only by end users in information centers but by IS personnel for prototype and applications development. Exhibit III-20 shows INPUT's projected growth of fourth-generation language (FGL) use over the next three years.
 - The almost tenfold increase in nonprogrammer use will emanate from information center and personal computer use. Although one of the purported attributes of fourth-generation languages is "user friendliness," adequate support by IS personnel is still required. The relatively slow growth rate of support personnel that INPUT projects could be inadequate for this expanding user base.

EXHIBIT III-19

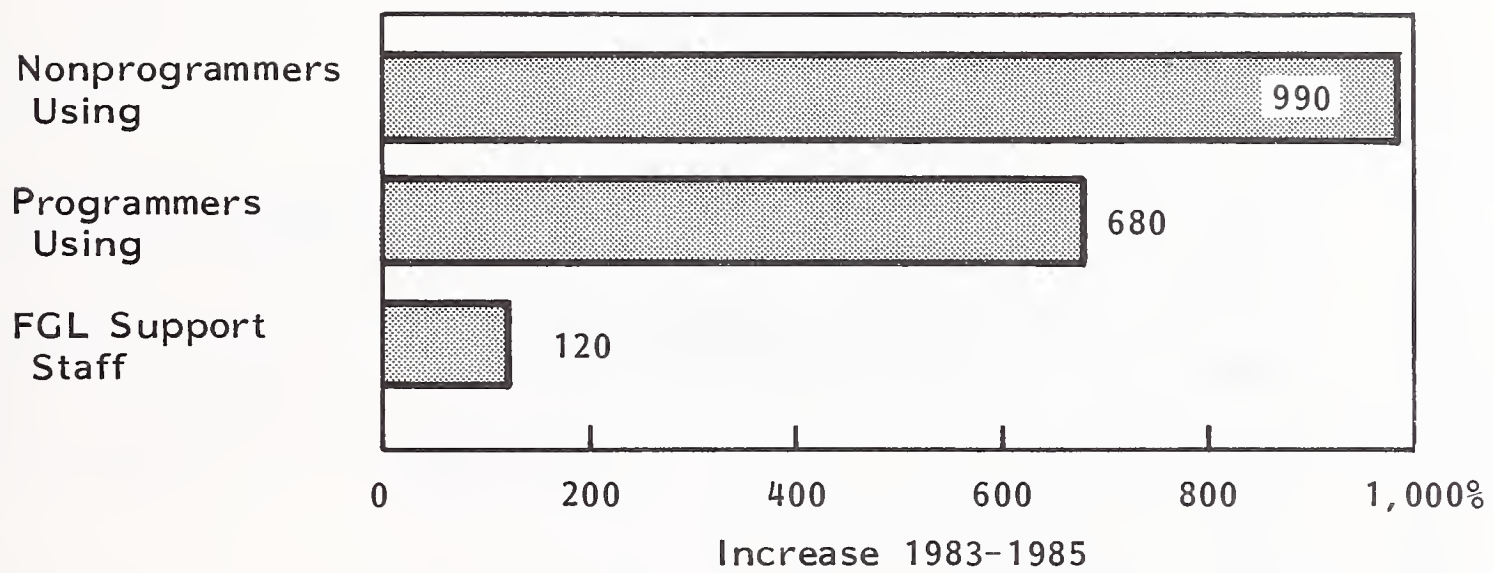
RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES BY COMPANY SIZE



SOURCE: INPUT Surveys

EXHIBIT III-20

EXPECTED INCREASES IN
FOURTH-GENERATION LANGUAGE USE



- The exhibit shows almost a sevenfold increase in programmer use of fourth-generation languages. In fact, fourth-generation languages were identified as the most significant aid for program development to be used in the last 12 months. Exhibit III-21 shows that FGLs topped training, software packages, and other development tools such as system management aids (e.g., JARS), structured programming (e.g., SPF), and programming utilities (e.g., CAPEX).
- INPUT's report The Opportunities of Fourth-Generation Languages, September, 1983, describes strategies for using FGLs in prototyping and applications development. INPUT predicts that FGLs will be one of the key resources that IS has to control in order to reduce the applications backlog.
- Applications development in the next 12 months will be evenly distributed between industry-specific and cross-industry applications (e.g., accounts receivable, payroll, and billing). Exhibit III-22 shows, for each industry, the distribution of industry-specific and cross-industry applications. Insurance and medical industry sectors have the highest concentration of industry-specific applications.
- The majority of the applications will be either developed with in-house resources or developed jointly with external resources or purchased software. Only 27% of the development for next year will use only external resources or unmodified software packages. Exhibit III-23 summarizes the sources of applications development by type of application.
- The recent announcement of the IBM PC 370 opens the doors to distributed program development on personal computers. Already on the market are PC versions of fourth-generation languages that allow data and program exchange between the mainframe and the PC. The PC 370 containing the 370 program instruction set can be a major boon to programmer productivity in the next five years. Distributed program development is a powerful tool awaiting

EXHIBIT III-21

FOURTH-GENERATION LANGUAGES (FGL)
ARE MOST SIGNIFICANT AID TO PROGRAM DEVELOPMENT

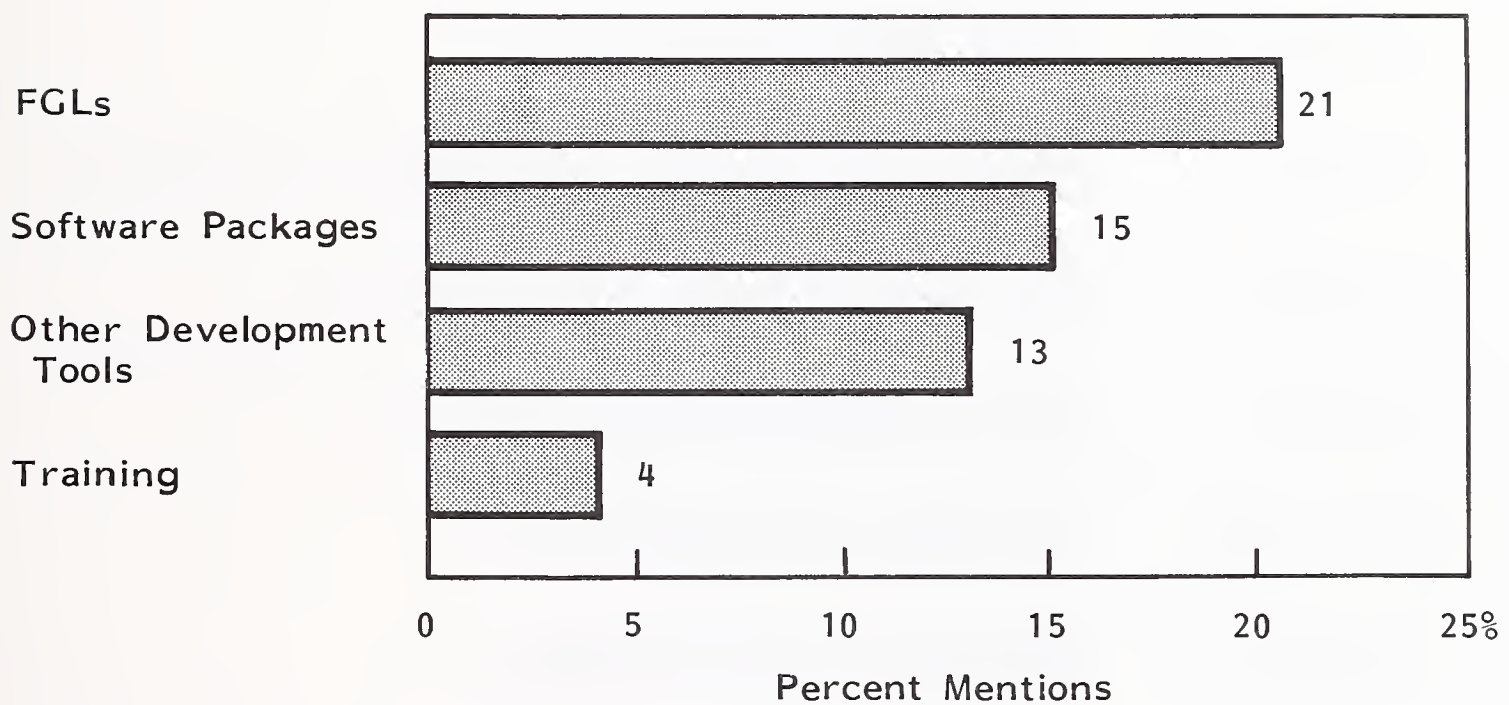


EXHIBIT III-22

DISTRIBUTION OF INFORMATION SYSTEMS APPLICATIONS: CROSS-INDUSTRY VERSUS INDUSTRY-SPECIFIC

(By Industry)

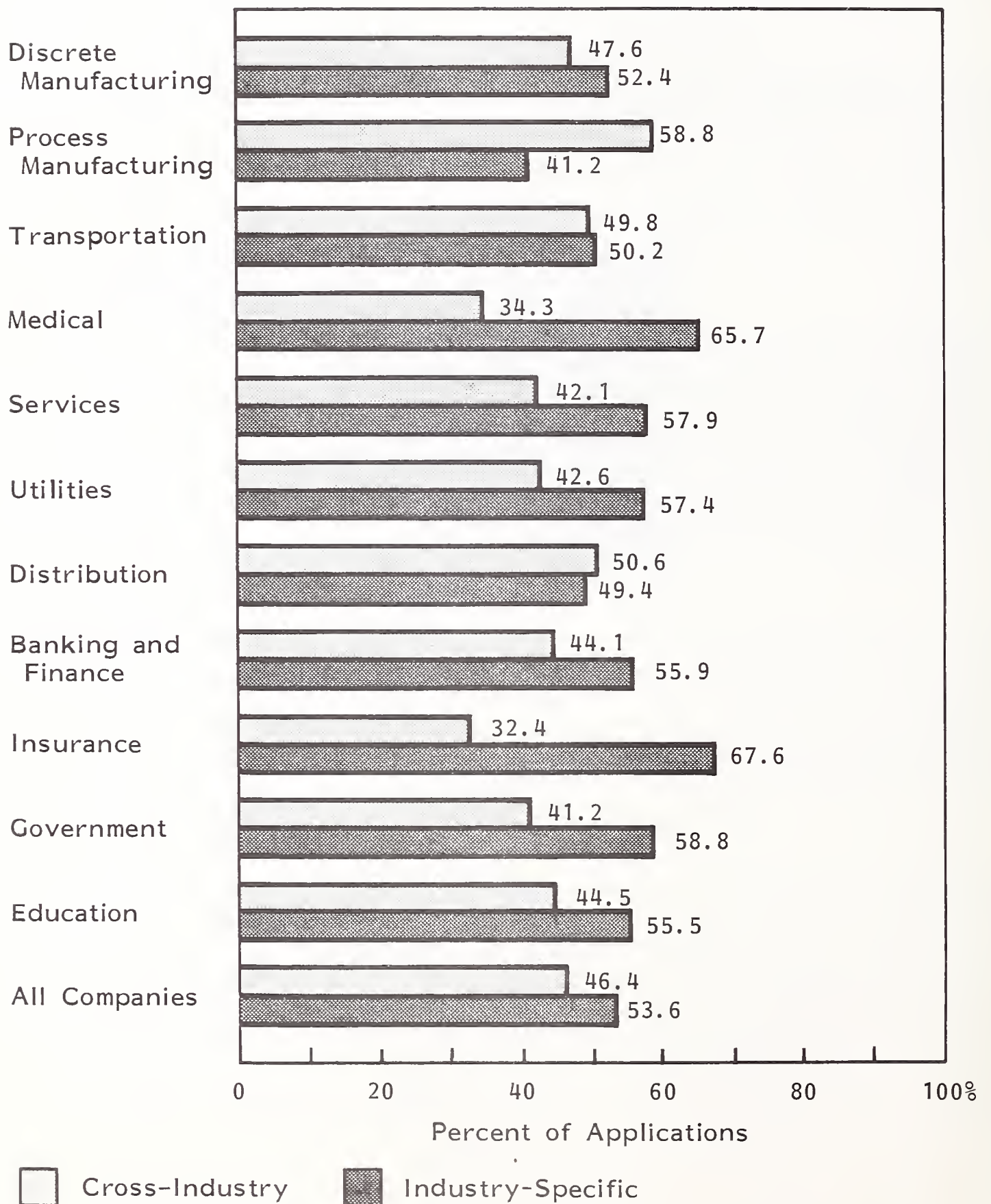
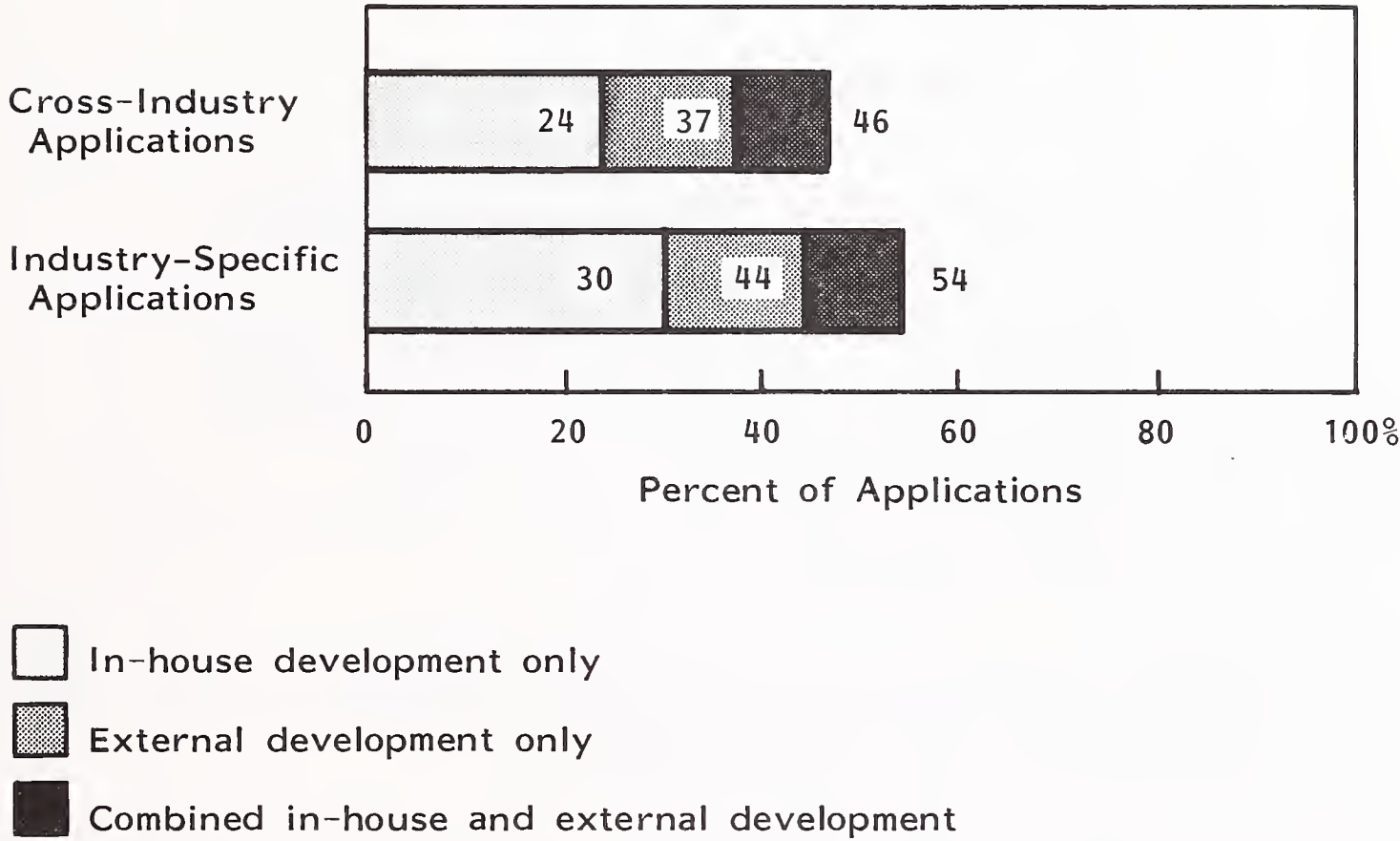


EXHIBIT III-23

SOURCE OF APPLICATION DEVELOPMENT



effective utilization. Distributed development, fourth-generation languages, and end-user computing can combine to be the death knell of excessive applications backlog.

4. END-USER COMPUTING

- End-user computing is an enigma. On one level it involves all computing tasks that non-IS professionals perform:
 - Data entry.
 - On-line inquiry.
 - User development programs.
- On another level it involves systems, products, and services.
 - Office systems.
 - Information centers.
 - Personal computers.
- End-user computing can also be an organizational entity. Exhibit III-24 shows an organization and its areas of responsibility.
 - Although very few firms have a formal end-user computing organization, most have dedicated resources to support end-user activities. Exhibit III-25 shows the median number of people that support office systems, information centers, and personal computers. The support levels are low. In fact, it can be argued that the support levels may be inadequate. INPUT's recent reports on information centers (Organizing the Information Center, August, 1983) and personal computer software

EXHIBIT III-24

AN END-USER COMPUTING ORGANIZATION

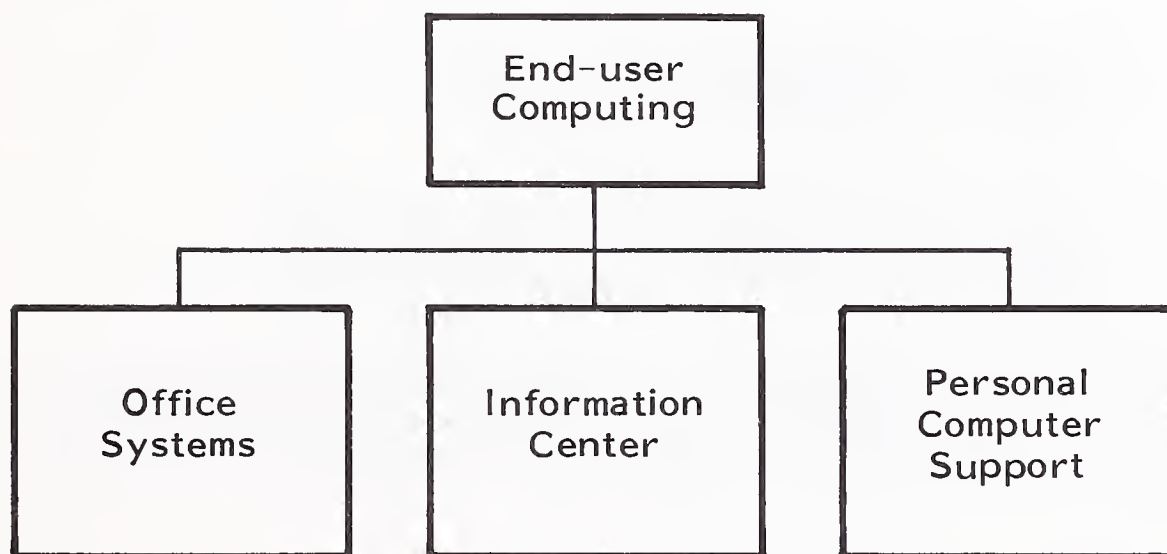
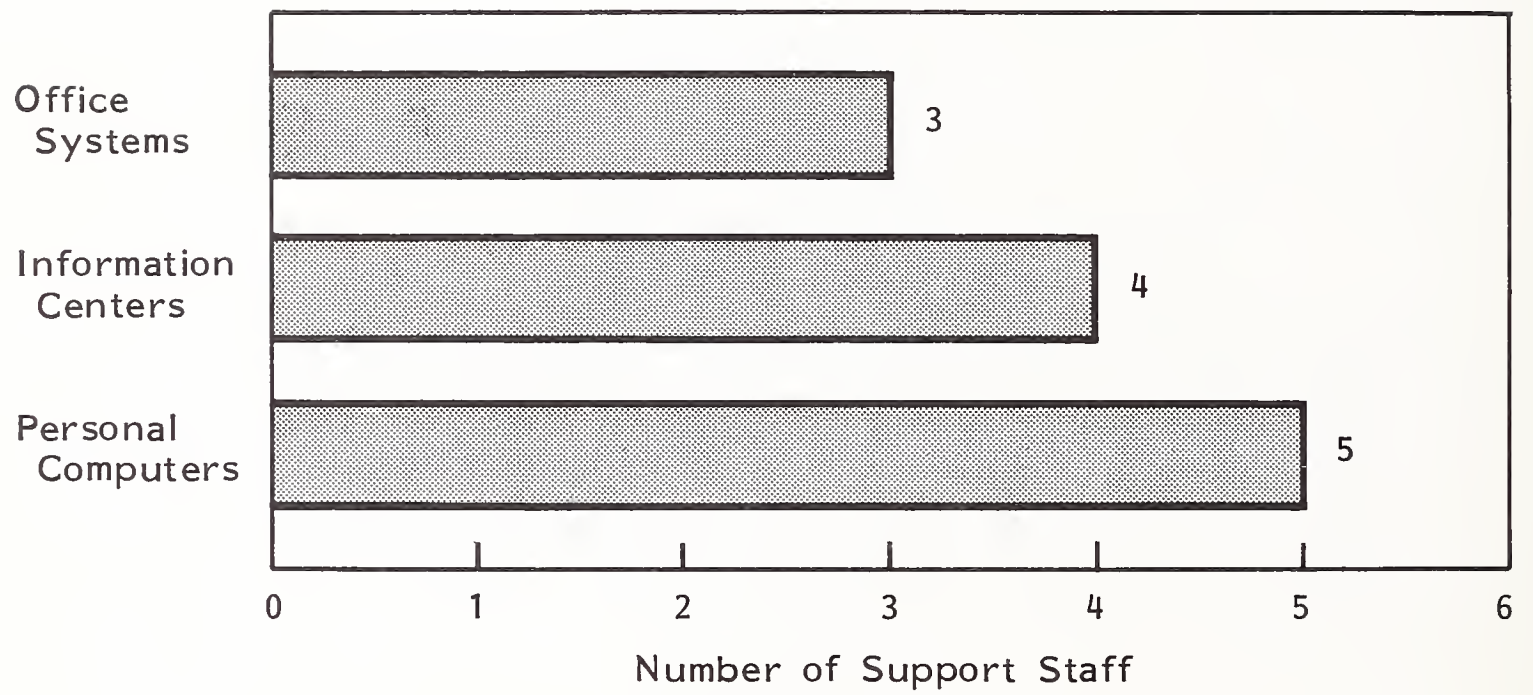


EXHIBIT III-25

MEDIAN I.S. SUPPORT PERSONNEL



support (Supporting Personal Computer Software, August, 1983) discuss the support strategies for these services and the dangers of inadequate support.

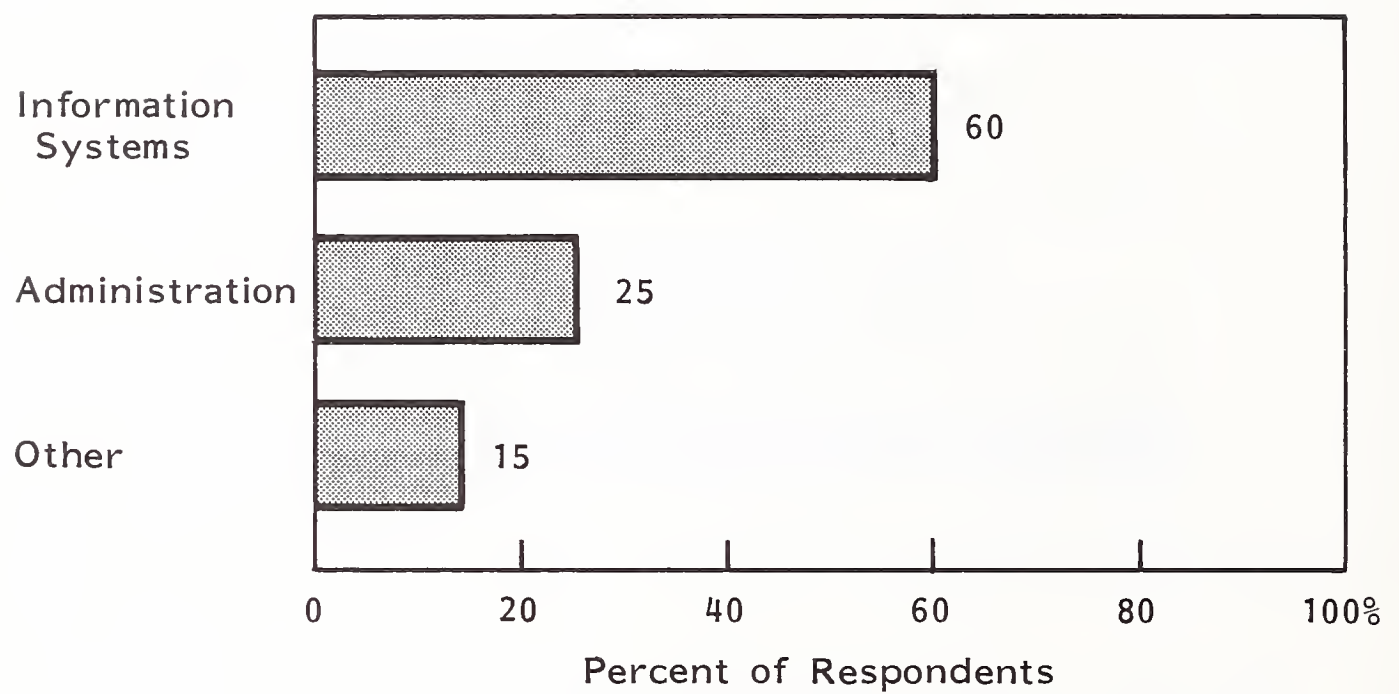
- Even though the median support levels are low, some organizations have over 50 people supporting these services.
- End-user computing or its component functions usually report to the IS organization. Exhibit III-26, however, shows a surprisingly high percentage of organizations have non-IS departments assume responsibility for end-user functions.
- Many companies still perceive office systems as being synonymous with word processing. Word processing support is usually outside of the IS organization.
- Some companies have elevated end-user computing to parity with IS. Both IS and end-user computing report to the same line manager (usually the general manager or the chief financial officer).

a. Office Systems

- The scope of office systems has multiplied. This term once contained only remote word processing systems that were perceived as automated typewriters. Office systems now includes all facets of computer-based processing that enhance the ability of organizations to meet their business objectives.
- Communications is the lifeline of the organization and similarly, the key component of office systems. Word processing is an old technology. It will be the information entry point for the office of the future. The challenge is to connect basically incompatible word processing systems into an integrated office system. The emergence of optical memory and image-scanning devices (such as the IBM Scanmaster) is bringing "the office of the future" closer to reality.

EXHIBIT III-26

TO WHOM DOES END-USER COMPUTING REPORT?



- Exhibit III-27 shows the current and planned installations of communications-based office systems.
 - The surprisingly high use of local-area networks points out the increasing use of shared fixed-disk systems for personal computers. Although these "networks" may not be part of the Ethernet/Wangnet genre, they are being used to share resources, one of the key purposes of local area networks. The use of products such as the IBM 8100 as a file, print, and communications server for a star network of IBM PCs will become more popular. This too may be perceived as a local-area network.
 - Computerized PBXs continue to grow. IBM/Rolm, and joint ventures between Data General/Rolm and Northern Telecom foreshadow the growing use of intelligent switches for combined data and voice communications.

b. Information Centers

- In INPUT's August 1983 report, Organizing the Information Center, the information center (IC) was defined as "enhanced in-house timesharing" for end users. The enhancement lies in a support organization design to train and assist in the use of IC. INPUT projected that the IC will become a cornerstone in the information strategy for the remainder of the 1980s. Exhibit III-28 shows that, consistent with this prognosis, over half of the respondents have ICs and three-quarters will have at least one by the end of 1984. Interestingly, the prevalence of ICs seems not to be related to company size. Most smaller companies report to have information centers already in operation.
- Exhibit III-29 identifies the typical information center applications. The primary vehicle for developing these applications is fourth-generation languages (FGLs).

EXHIBIT III-27

EXTENT OF USE OF OFFICE SYSTEM ELEMENTS

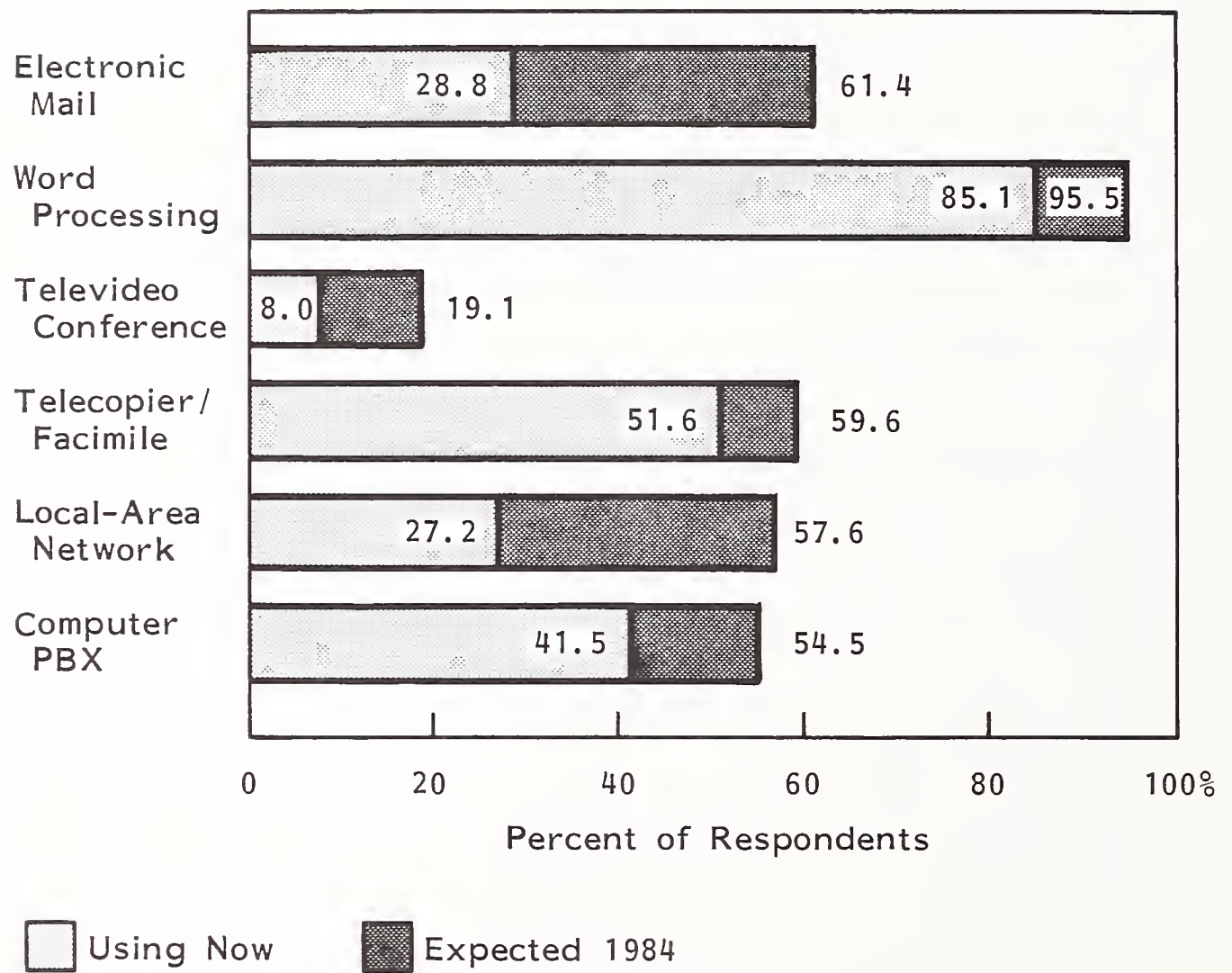
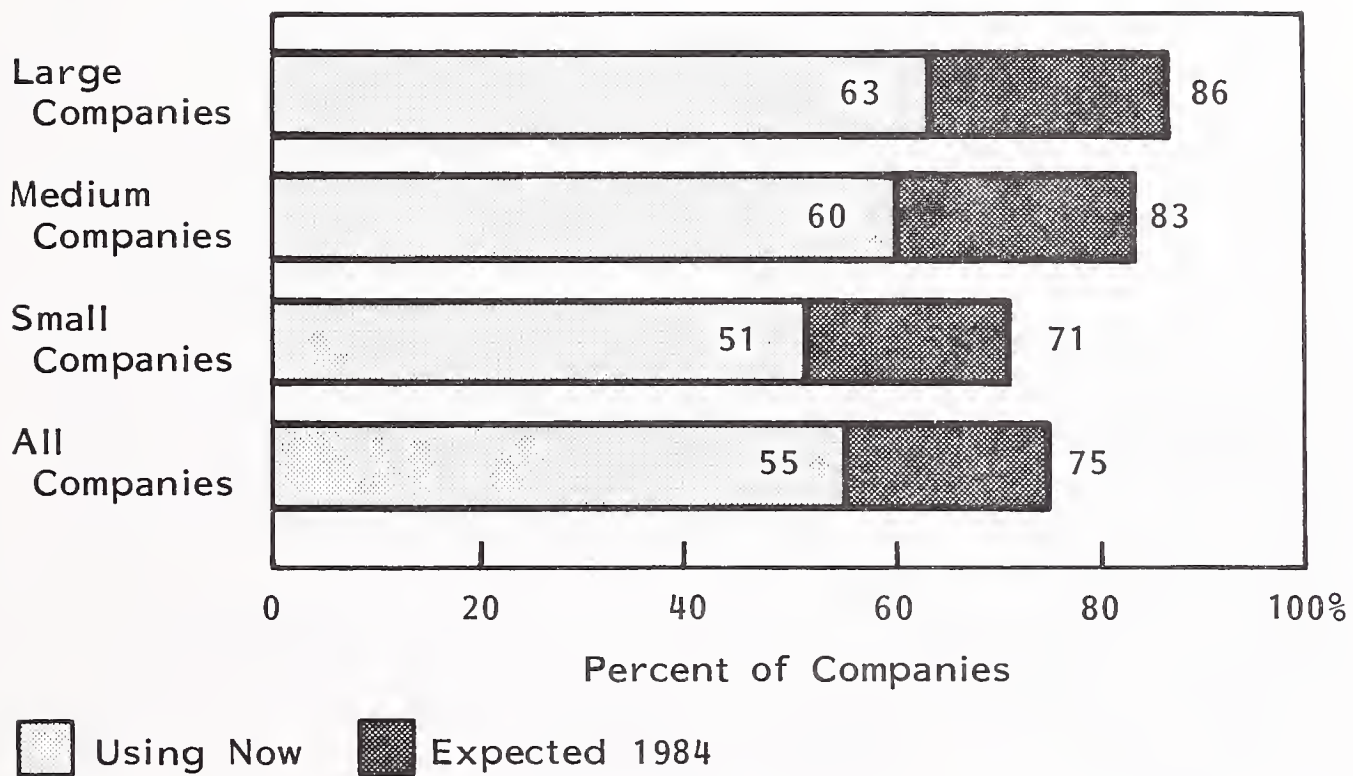


EXHIBIT III-28

INFORMATION CENTER INSTALLATIONS



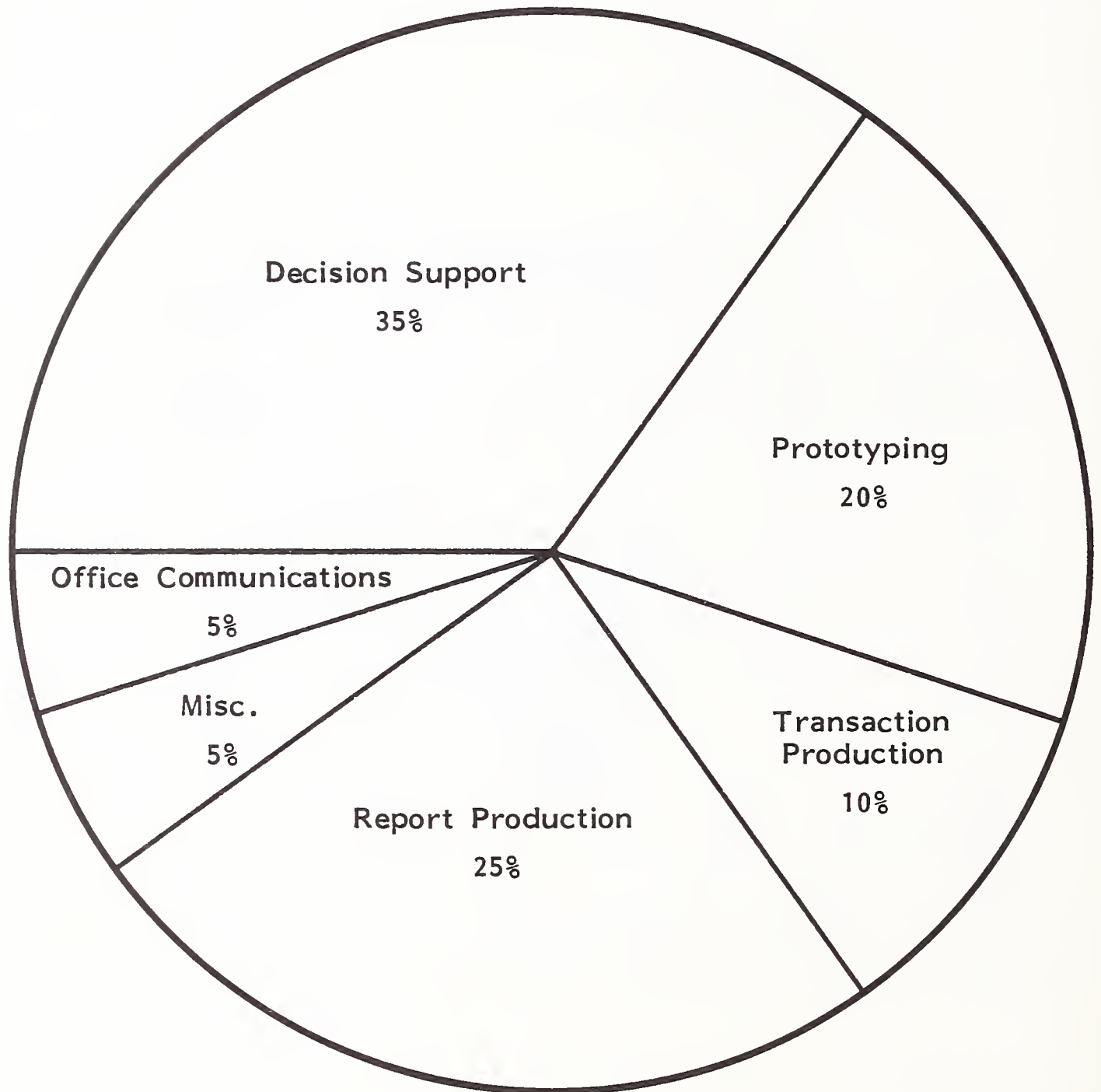
Large Companies: Revenues over \$1 billion

Medium Companies: Revenues \$251 million to \$1 billion

Small Companies: Revenues less than \$250 million

EXHIBIT III-29

TYPICAL INFORMATION CENTER APPLICATIONS



- Exhibit III-30 describes the characteristics and categories of fourth-generation languages.
- Exhibit III-31 shows the distribution of IC by department. Finance is the category with the highest number of users, reflecting finance's need for information not provided from traditional IS sources. The use of decision support and report generation applications is consistently the number one application used by non-IS personnel.

c. Personal Computers

- IS management considers the increasing use of personal computers to be the most significant change affecting their department in the next three years.
- The growth of personal computers will continue to be high. Exhibit III-32 gives INPUT's projections of personal computer growth over the next five years. The 19% growth rate over this period will be a key contributor to the projected simultaneous five-fold increase in the number of workstations.
- Most of the interviewed companies were accelerating their use of personal computers. The number of personal computers will grow at an annual 83% rate.
 - The portion of the IS budget that is assigned to personal computers, however, is only growing at 14% per year.
 - Most personal computer funding comes directly from end-user budgets, as reflected in Exhibit III-33.
- Personal computer applications were initially administrative and standalone. This is changing. Communications is becoming a prerequisite for many applications.

EXHIBIT III-30
FOURTH-GENERATION LANGUAGES

Characteristics

- Nonprocedural (i.e., focuses on the result, rather than the process of obtaining the result).
- English-like.
- Nontechnical.
- Flexible.
- Fast initial learning period.
- Often have built-in functions (e.g., DBMS, statistics, financial, graphics, text editor).

MAJOR TYPES	PRODUCT EXAMPLES
Generalized Tool	FOCUS INQUIRE RAMIS II NOMAD 2
Tools Linked to a Specific Data Base Product	NATURAL IDEAL On-line English
Application Generators	MARK V MANTIS
Modeling Languages	EXPRESS System W VisiCalc (Micro) 1-2-3 (Micro)

EXHIBIT III-31

DEPARTMENTS USING THE INFORMATION CENTER

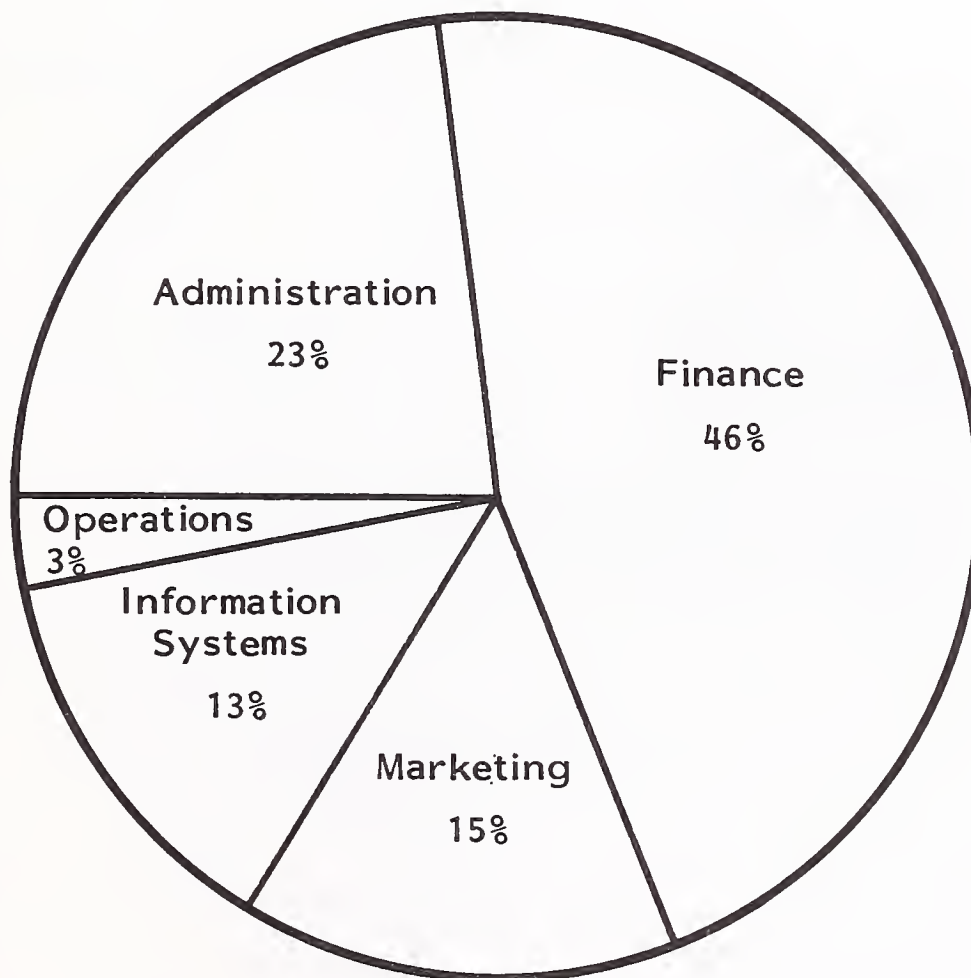


EXHIBIT III- 32

PERSONAL COMPUTER FORECAST
(Business Usage)

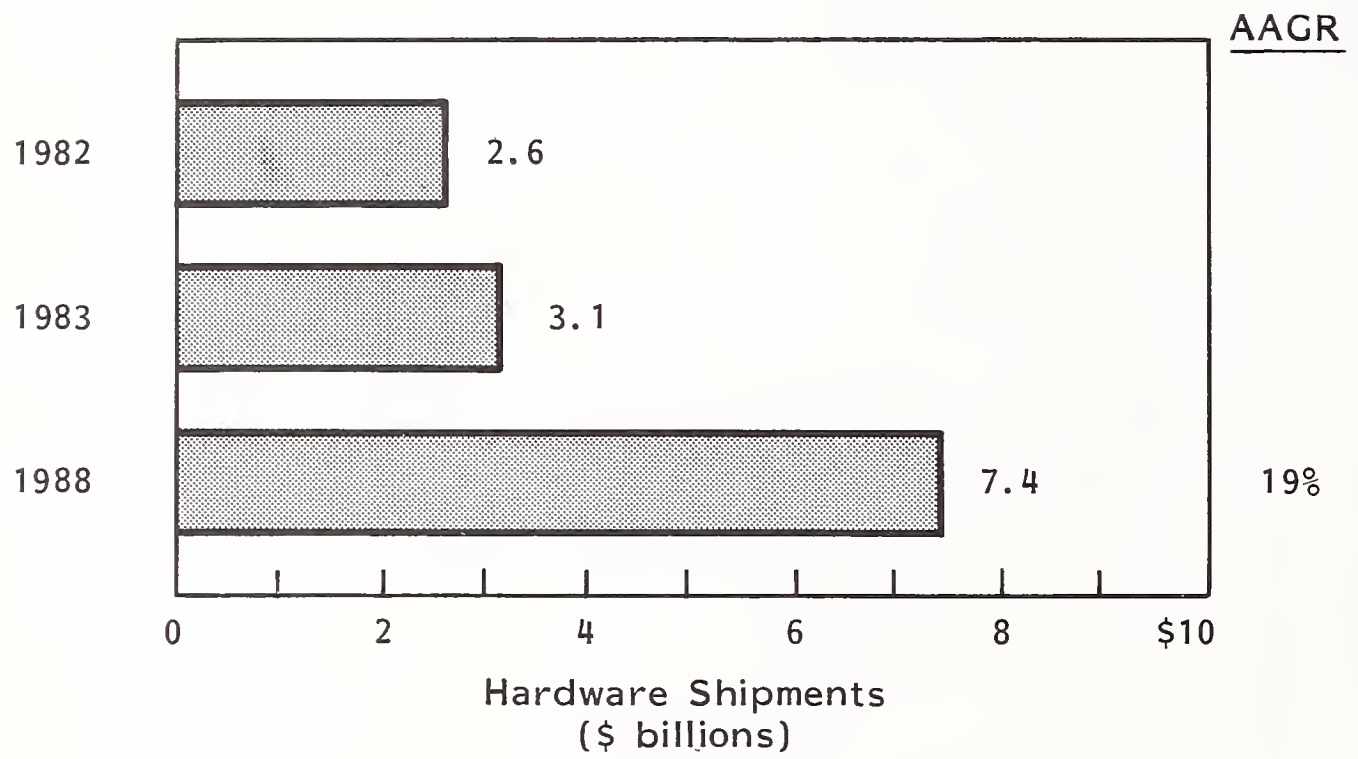
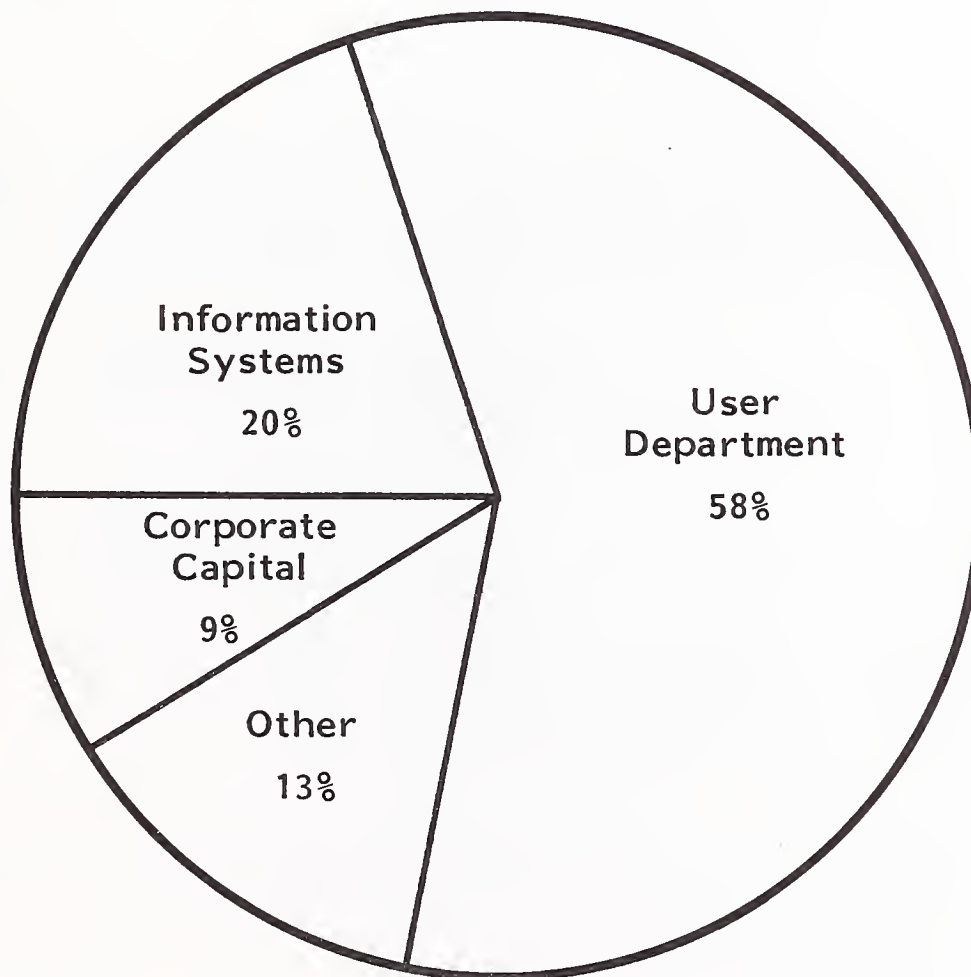


EXHIBIT III-33

BUDGET SOURCES FOR PERSONAL COMPUTER FUNDS



- Exhibit III-34 demonstrates that a significant number of companies have their personal computer communicating with mainframe computers and other personal computers.
- The actual number of personal computers participating in these communications, however, is low.
 - . For example, as shown in Exhibit III-35, 57% of the companies have less than 20% of their personal computers communicating with the mainframe.
 - . INPUT projects that the number of personal computers accessing the mainframe computer will grow significantly. Evidence of this is IBM's recent announcement of PC 370, PC 3270, and file transfer software. This software will enable transfer of data from IBM PC to and from an IBM mainframe merely by executing a simple command.
- The explosive growth of PCs within the organization must be managed. The IS organization is uniquely qualified to play a prominent role in assuring the successful use of personal computers in the organization.
 - The data processing expertise developed through years of experience is directly applicable to end-user computing in general and to personal computers in particular.
 - The increased demand of personal computer users to communicate among their computers and access information that resides on the mainframe computers will force IS participation.
 - INPUT's report, Personal Computers in the IS Strategy, December, 1982, describes various alternative IS strategies for managing the

EXHIBIT III-34

CURRENT PC COMMUNICATION

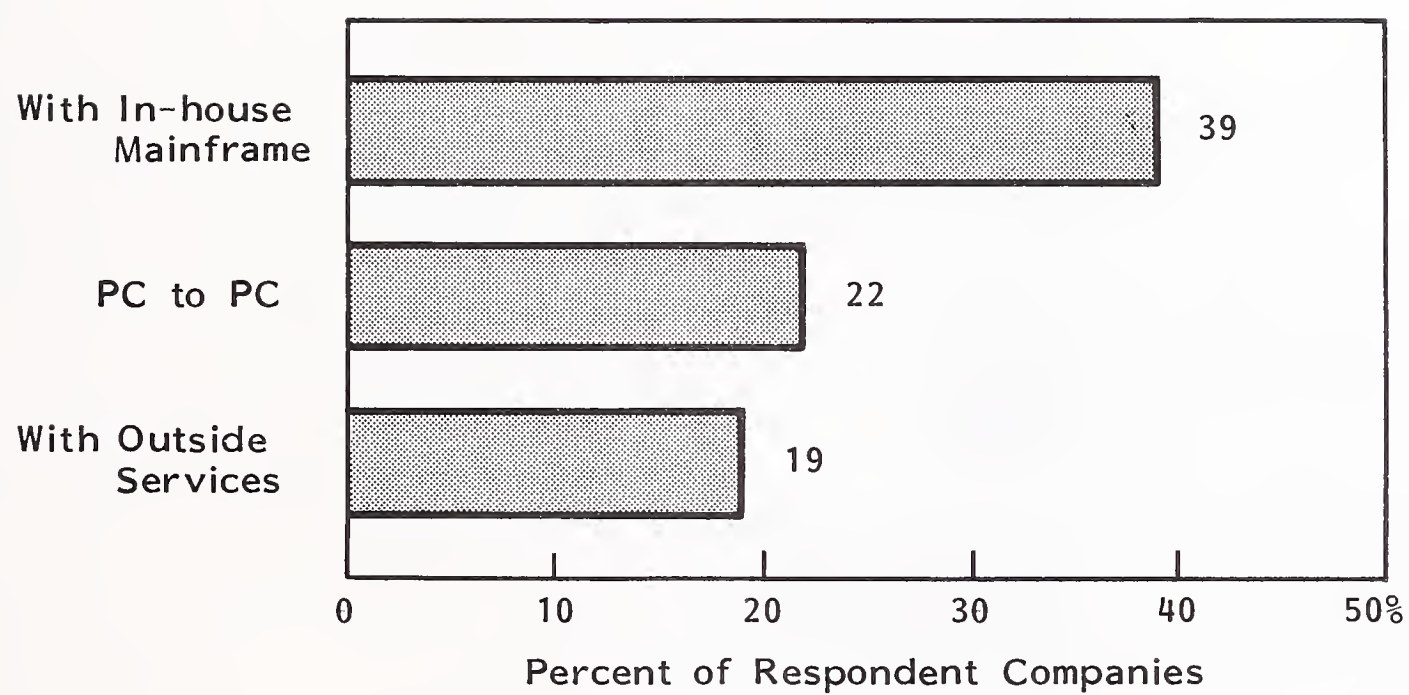
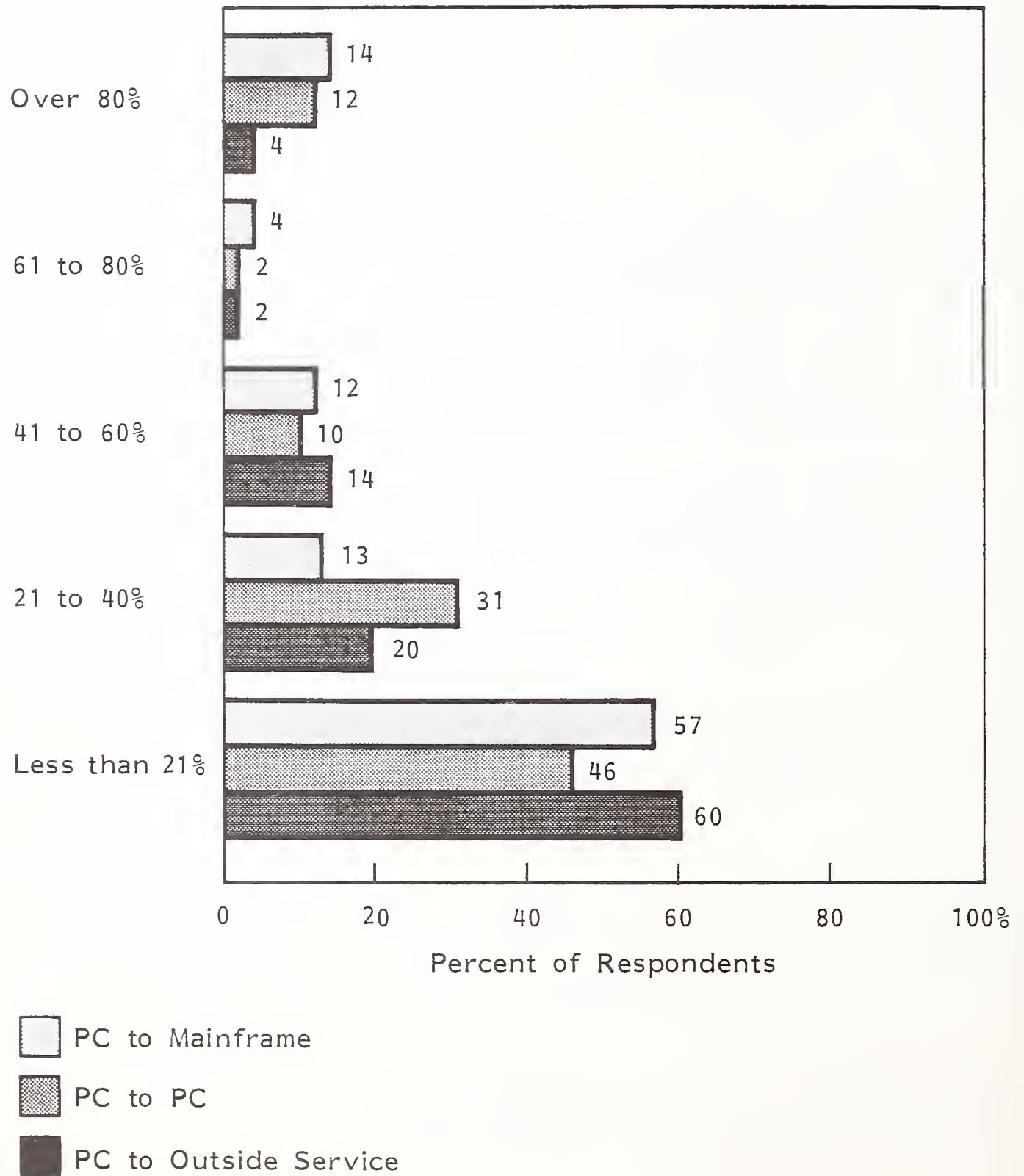


EXHIBIT III-35

RATIO OF PCs WITH COMMUNICATION
TO TOTAL PCs



growth, use, and support of PCs in an organization. The report recommends IS take an active, coordinative role. This is still true and can be extended beyond personal computers to all aspects of end-user computing. Extension requires an IS commitment to supporting end-user needs. The demand for this support must be satisfied, if not by IS then by some other group within or outside the company. It is up to IS to either take the initiative now or face the consequences of dealing with many splinter end-user support groups.

IV INDUSTRY SECTOR ANALYSIS

IV INDUSTRY SECTOR ANALYSIS

A. INTRODUCTION

- This chapter presents a summary of the Annual Survey's findings for each industry. Appendix A provides the distribution of respondents by industry and Appendix B contains a copy of the Annual Survey.
- The following topics will be discussed for each industry:
 - Overview of the events affecting the industry (industry overview).
 - IS budgets.
 - IS managers' planning issues.
 - IS applications development.
 - End-user computing.
- Information centers will only be discussed where there is a major variance from the composite information discussed in Chapter III.

B. DISCRETE MANUFACTURING SECTOR

I. INDUSTRY OVERVIEW

- The performance outlook of the discrete manufacturing sector in the past year is mixed, depending on the particular industry segments that are considered.
- Traditional sectors, such as transportation equipment and industrial machinery, have done poorly but have generally upbeat outlooks. They have learned to operate profitably at lower outputs and are poised to take advantage of the economic recovery. Industrial machinery and heavier transportation equipment, however, will have to wait until interest rates come down before they can increase sales substantially.
- The newer sectors, in particular electrical and electronic goods and office equipment, did much better this year and should continue growing.
- The nature of information systems in these industries is changing.
 - The large centralized computer is yielding to small, interactive, distributed, and specialized systems.
 - Making specialized computer-aided design/computer-aided manufacturing (CAD/CAM) work together is becoming critically important. Current CAD/CAM suppliers are working to make their systems suitable as cores for integration.
 - Software is becoming a much larger part of the value added in all of the products in this sector.

2. BUDGET ANALYSIS

- In this sector 91% of the companies expect information systems budgets to increase in 1984, compared to 88% for all industries. Nine percent expect budgets to remain the same and none expect decreases.
- The average budget growth expected in 1984 is 6%.
 - In 1983 budget growth was 7%.
 - The expected budget growth in 1984 for all industries is 7%.
- Exhibit IV-1 shows the distribution of expenses in discrete manufacturing information systems budgets.
- The discrete manufacturing sector budget breakdown closely parallels the average of all industries.
 - At 44%, personnel expenses dominate the budget.
 - Hardware expenses are the next largest, at 29%, followed by software at 10%.
- The largest increase in expenditures expected in 1984 is in terminal purchases, which should go up 8%.
 - This is in marked contrast to the industry composite where the biggest increase is in personal computers (14%).
 - Communications and custom programming expenses are also expected to increase significantly - about 7%.

EXHIBIT IV-1

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES IN THE DISCRETE MANUFACTURING SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	43.6%	4.7%
Mainframe Processors	10.5	1.8
Minicomputers	6.0	3.2
Micro-personal Computers	3.5	3.2
Terminals	2.8	8.3
Peripherals	6.2	3.9
Total Hardware	29.0%	3.0%
Communications	7.1	6.6
External Software	4.7	5.4
Custom Programming	4.9	6.6
Integrated Systems	0.2	0.8
Total Software	9.8%	4.5%
Software Maintenance	1.9	5.5
Hardware Maintenance	3.5	5.6
Total Maintenance	5.4%	5.7%
Outside Processing Services	2.5	0.6
Other	2.5	4.2
Total	100.0%	6.1%

- Information systems budgets as a percent of total discrete manufacturing corporate revenue is 1.4%. This is significantly above the .9% average for all industries.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Concern about information services issues expressed by senior discrete manufacturing executives closely parallels that of other industries, as shown in Exhibit IV-2.
 - Cost is clearly the dominant issue for senior management.
 - Hardware issues are also considered important - doubtlessly because of their close relationship to cost concerns and their tangibility.

b. Problems

- Senior information systems management in the discrete manufacturing sector see software as their number one problem, as shown in Exhibit IV-3. They rate it higher as a concern than they do any other industry sector.
- Personnel, planning, and control also are regarded as major problems by discrete manufacturers, but are not accorded similar importance as objectives (See section 3.C below.)
 - Training scores especially high as a personnel concern.
 - Within planning and control, backlog issues generate the most interest.
- Corporate relations, the highest-rated problem last year, is now fourth. User and management relations are the main elements of concern in this category.

EXHIBIT IV-2

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE DISCRETE MANUFACTURING SECTOR

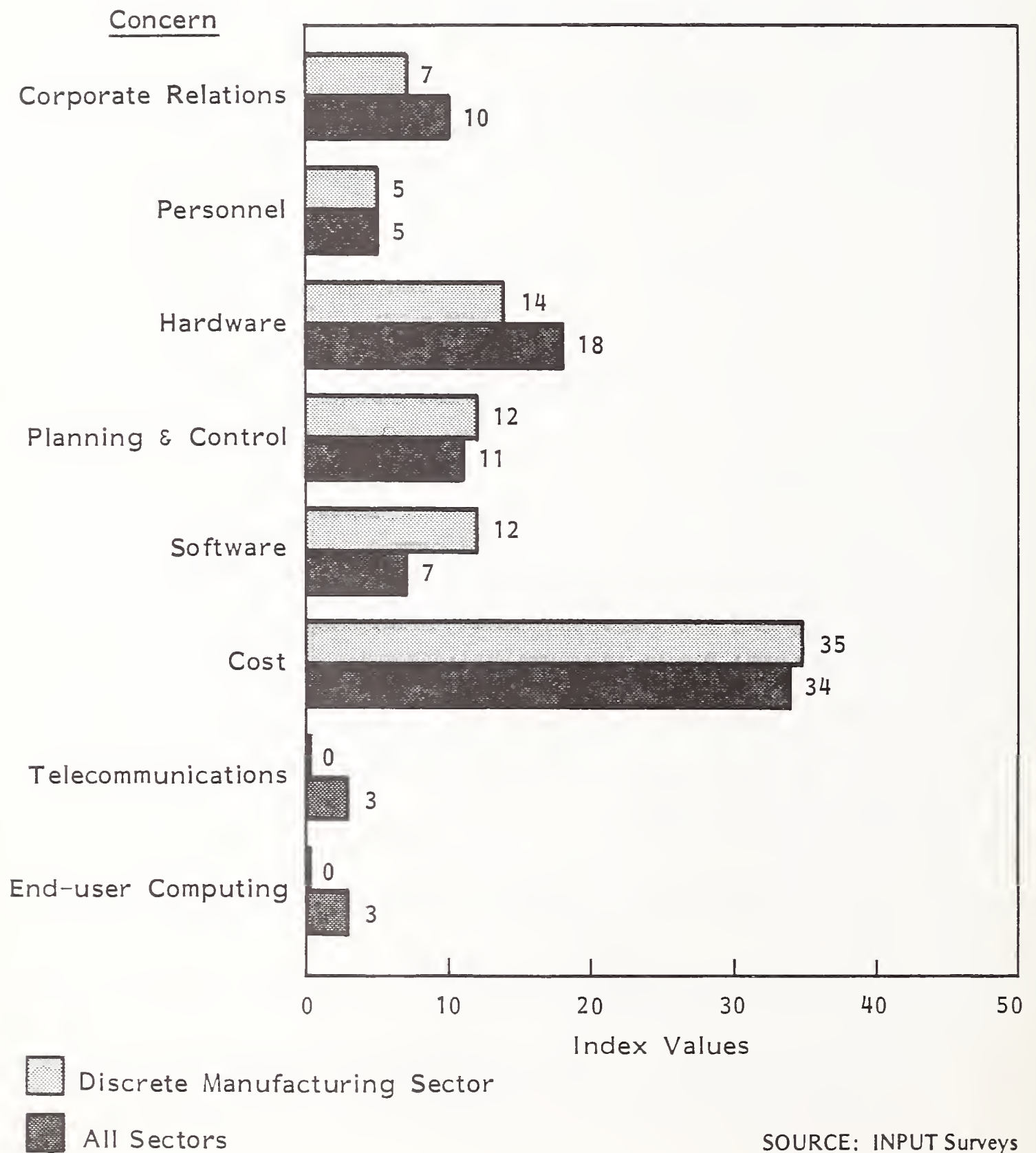
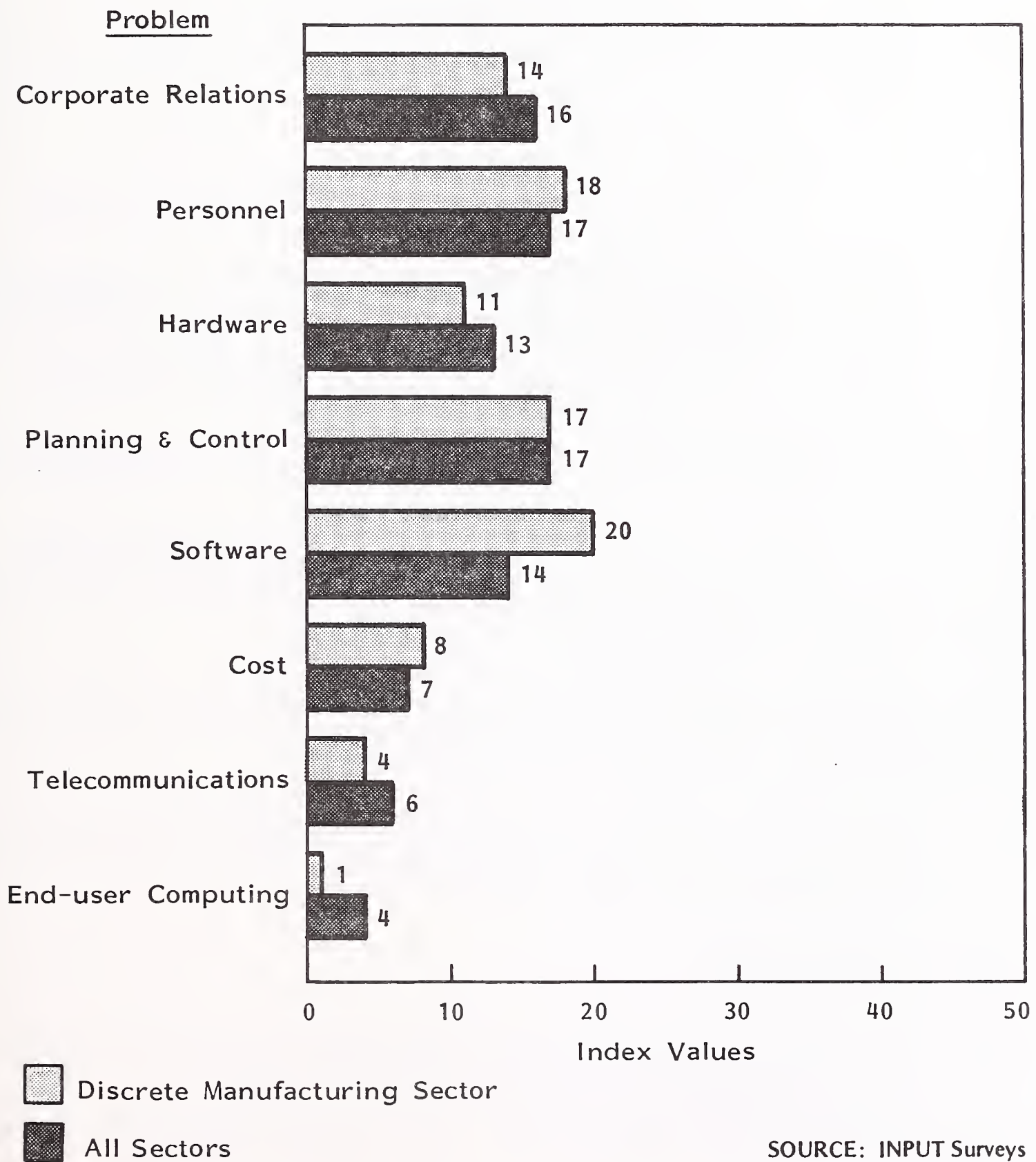


EXHIBIT IV-3

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE DISCRETE MANUFACTURING SECTOR
(IMPORTANCE TO U.S. MANAGERS)



- The relatively low regard for cost issues is in stark contrast to the concerns of senior management.
- End-user computing causes the industry the least concern; only one other sector, distribution, rates it as low.
- Exhibit IV-4 shows the planning issue subgroups that were rated as top problems in this sector.

c. Objectives

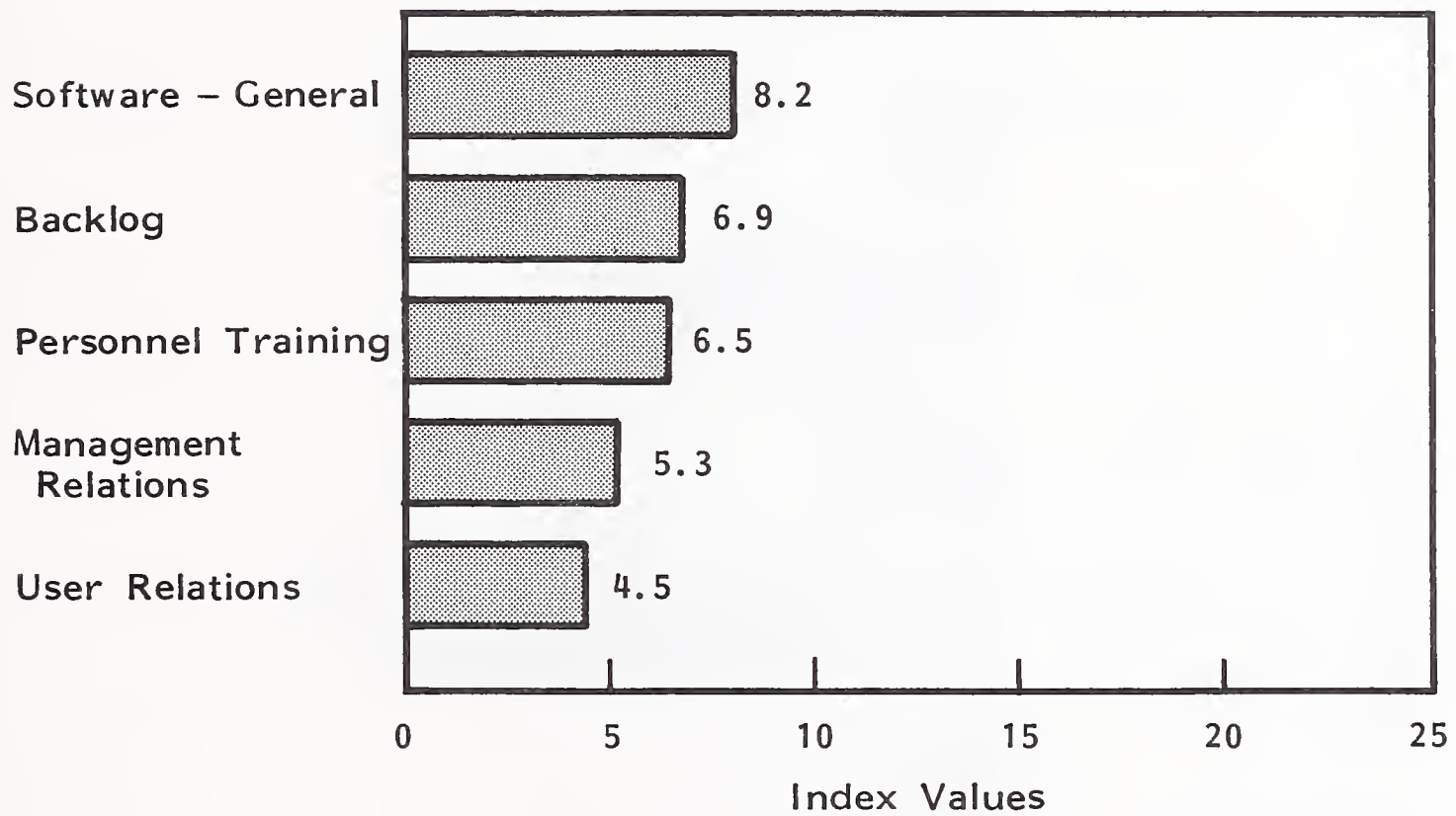
- Accomplishment of software objectives is extremely important to discrete manufacturers; the next most important objectives, those dealing with hardware, are less than half as highly rated, as shown in Exhibit IV-5.
 - Accomplishment of software applications objectives is rated especially high.
 - Within the hardware category, managers express the greatest interest in upgrade objectives.
- Corporate relations objectives, especially those dealing with users, are also rated high. Cost objectives are rated lowest.
- Exhibit IV-6 contains the top objectives for this sector. These objectives are at the planning issue subgroup level of detail.

4. APPLICATIONS

- The top five information systems applications planned by managers in the discrete manufacturing industry are shown in Exhibit IV-7. Forty-eight percent of the respondents said that they will be developing cross-industry

EXHIBIT IV-4

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE DISCRETE MANUFACTURING SECTOR (IMPORTANCE TO I.S. MANAGERS)



SOURCE: INPUT Survey

EXHIBIT IV-5

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES IN THE DISCRETE MANUFACTURING SECTOR (IMPORTANCE TO I.S. MANAGERS)

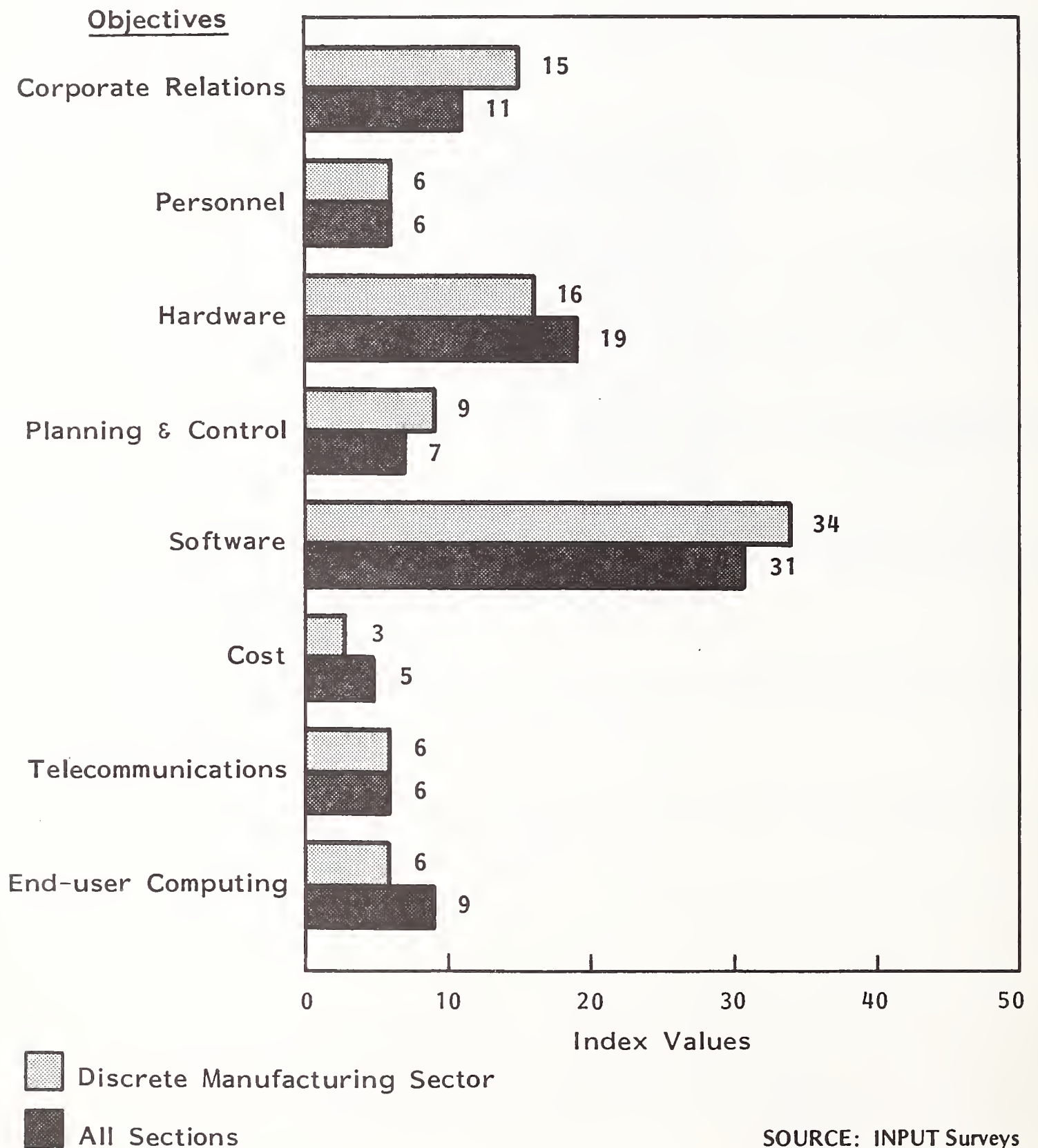


EXHIBIT IV-6

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
DISCRETE MANUFACTURING INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

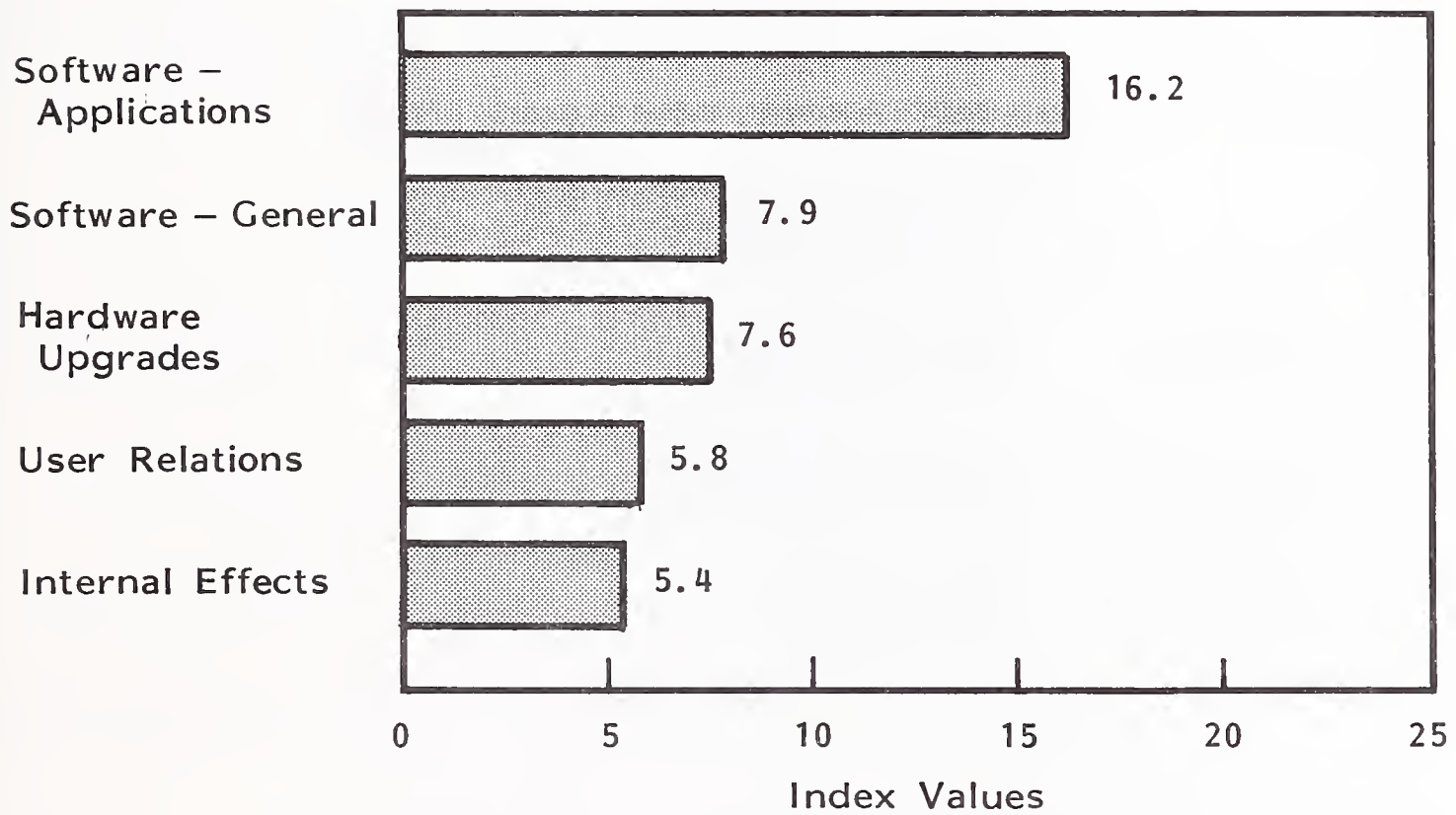
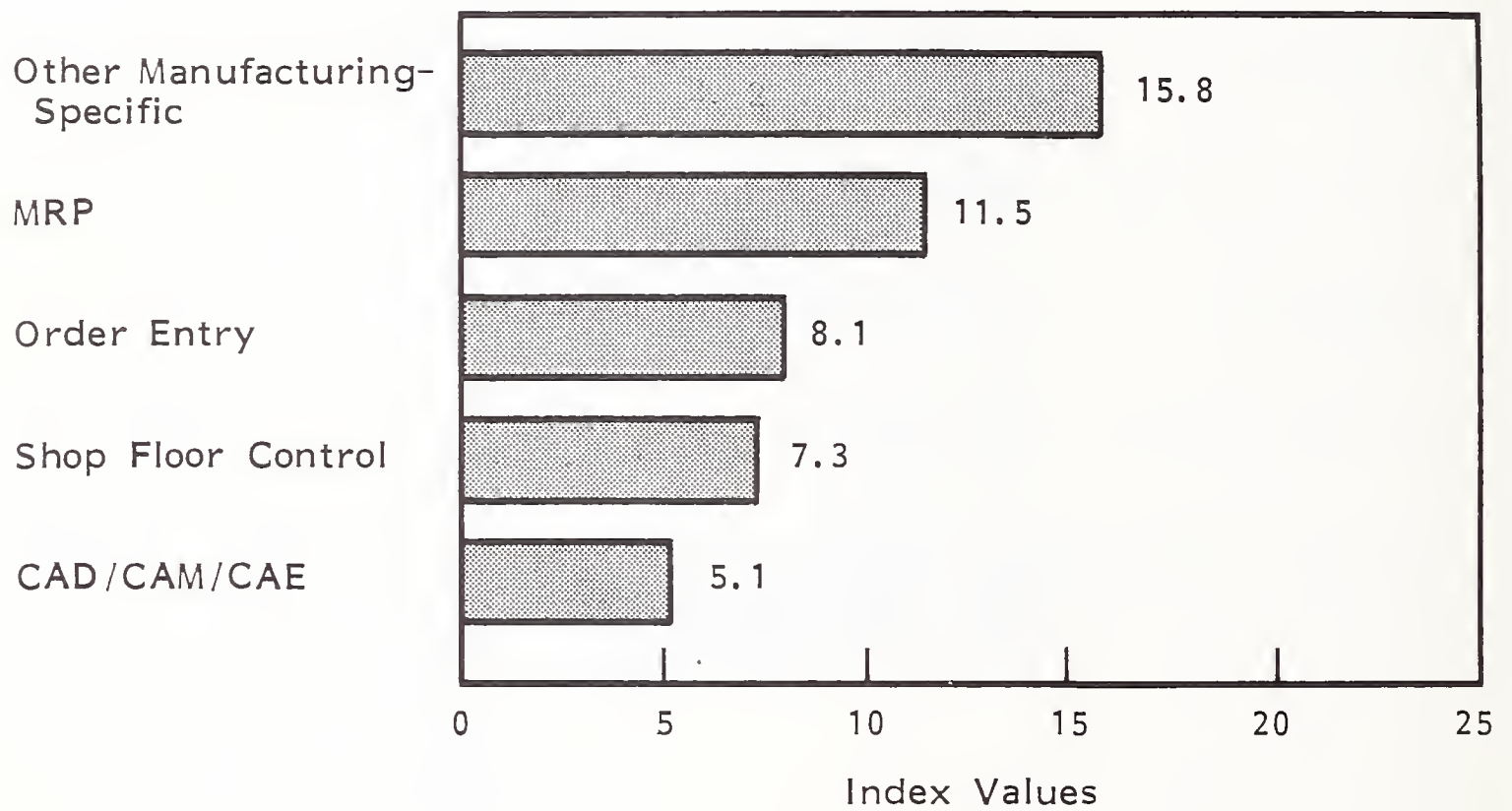


EXHIBIT IV-7

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS FOR THE DISCRETE MANUFACTURING INDUSTRY (IMPORTANCE TO I.S. MANAGERS)



applications, while the remaining 52% said they will be developing industry-specific applications.

- More information systems managers hope to develop material requirements planning applications than they do any other industry-specific application. Shop floor control, manufacturing systems, and CAD/CAM/CAE applications also rate high in popularity.
- Many information systems managers anticipate order entry applications to be developed in the next year. Other cross-industry applications in the making include accounting and financial planning applications.
- The most significant events affecting applications development within the companies interviewed were software upgrades and the implementation of manufacturing control systems. Also noted as significant was the addition of "on-line" systems and application development tools.
- Information systems managers in the discrete manufacturing industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the discrete manufacturing industry was the recession. Competition and internal effects were also noted as affecting applications development. Respondents equally mentioned personal computers as having an affect on applications.

5. END-USER COMPUTING

a. Office Systems

- The most dramatic growth of office systems applications in the discrete manufacturing sector will be seen in local-area networks, which one-fifth of our respondents now report using and another two-fifths intend to be using by the close of 1984. Details can be seen in Exhibit IV-8.
- The highest penetration of office systems products is in word processors, which three-quarters of our respondents report using now, and which another fifth intend to be using by the end of 1984. These figures are comparable to those for the penetration of word processors into all industries.
- Over half of respondents report that they now use PBXs and telecopiers or facsimile devices. A third now use electronic mail, with another third reporting plans to use it by the end of 1984.
- Few report using televideo conferencing, and not too many will be adding it in 1984.

b. Personal Computers

- Over four-fifths of our respondents in the discrete manufacturing sector report personal computers in their organizations. As shown in Exhibit IV-9, on average there are 88 in each organizational entity; by 1986, there will be 288, reflecting a compound annual growth rate of 49%. Personal computer communications links are summarized in Exhibit IV-10.
- About 2% of the personal computers in this sector communicate with other devices. A third of our respondents report some links with in-house computers, a sixth report links with other personal computers or word processors, and another sixth have PCs communicating with outside services.

EXHIBIT IV-8

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE DISCRETE MANUFACTURING INDUSTRY

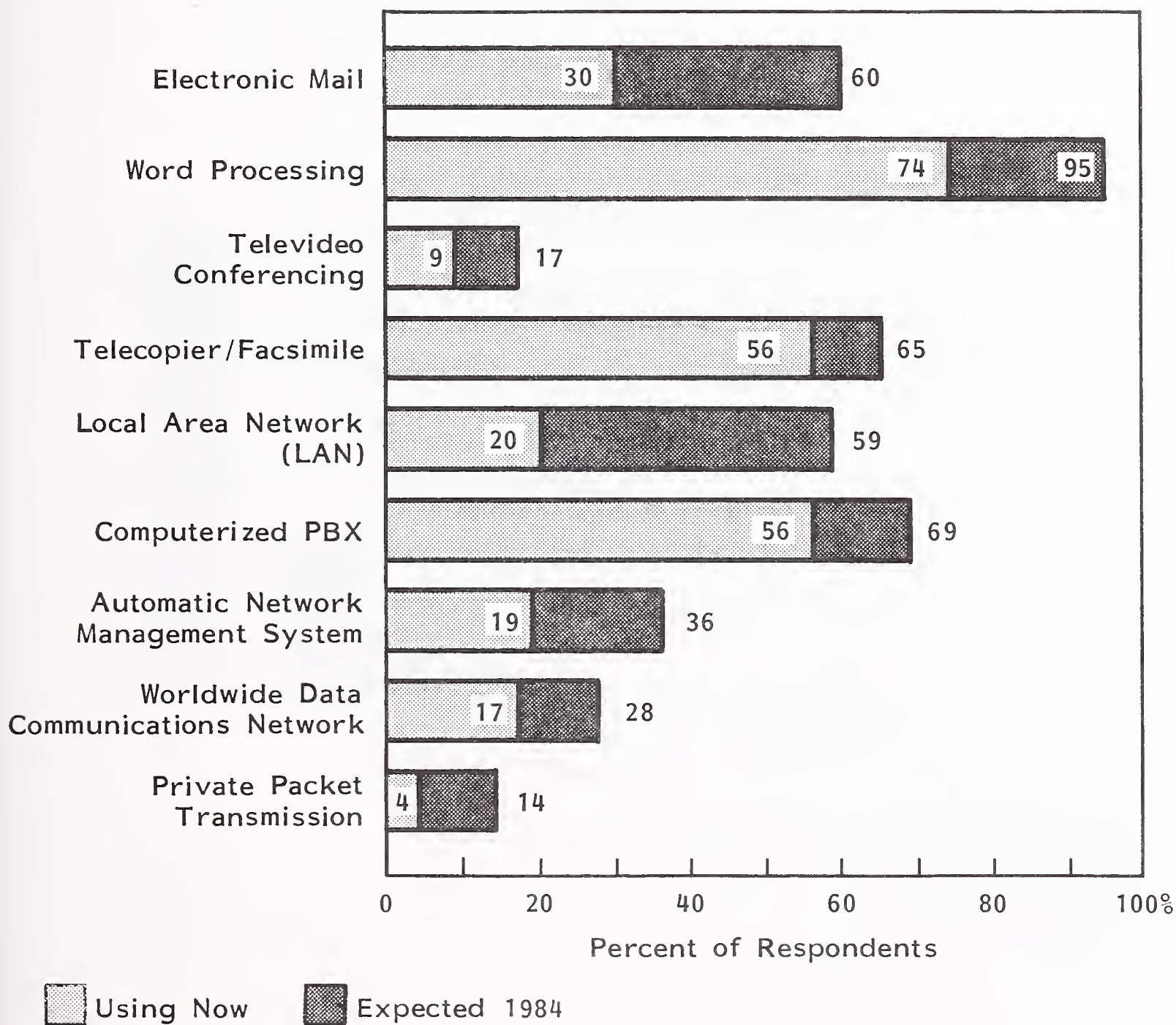
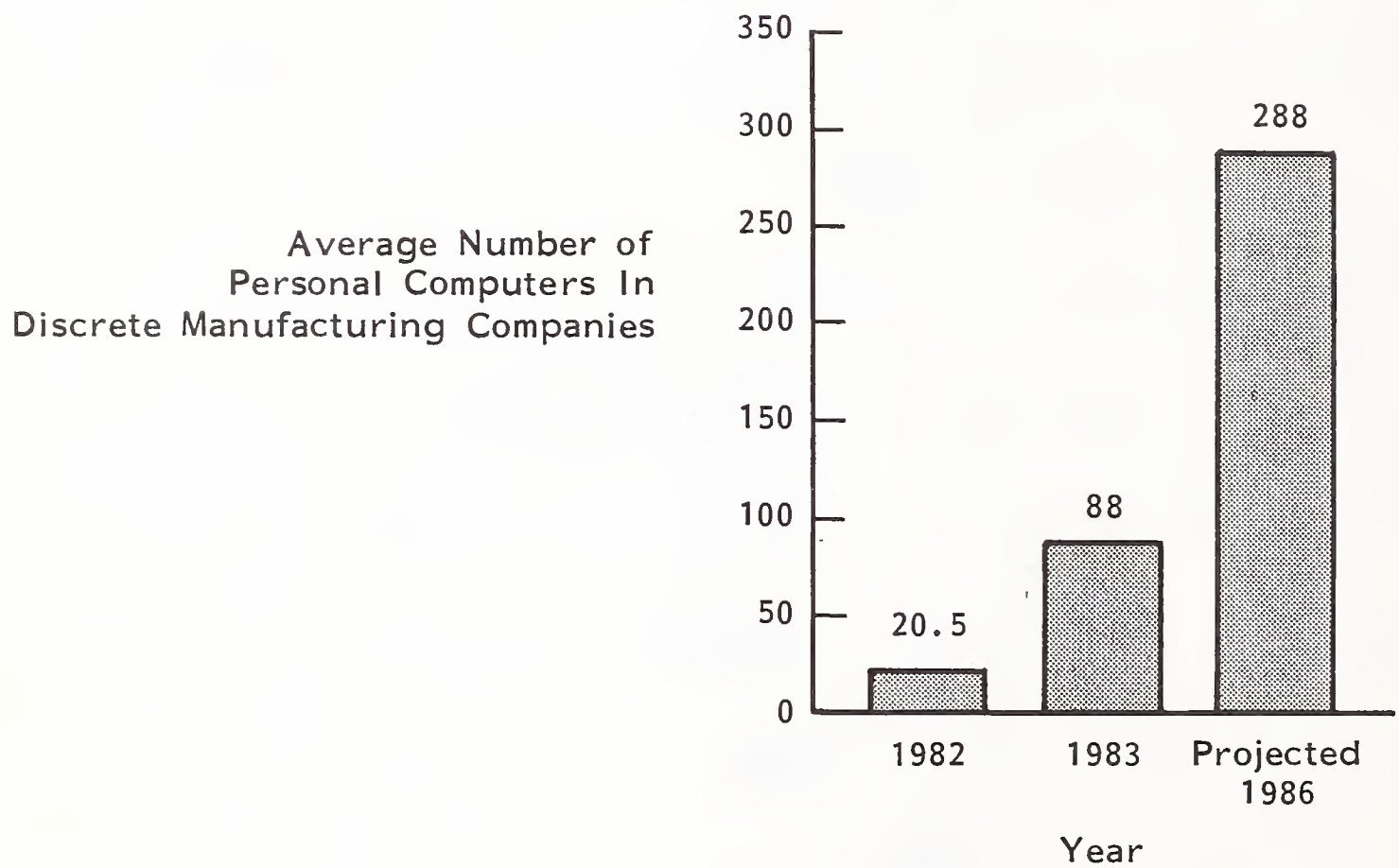


EXHIBIT IV-9

NUMBER OF PERSONAL COMPUTERS IN
DISCRETE MANUFACTURING SECTOR COMPANIES



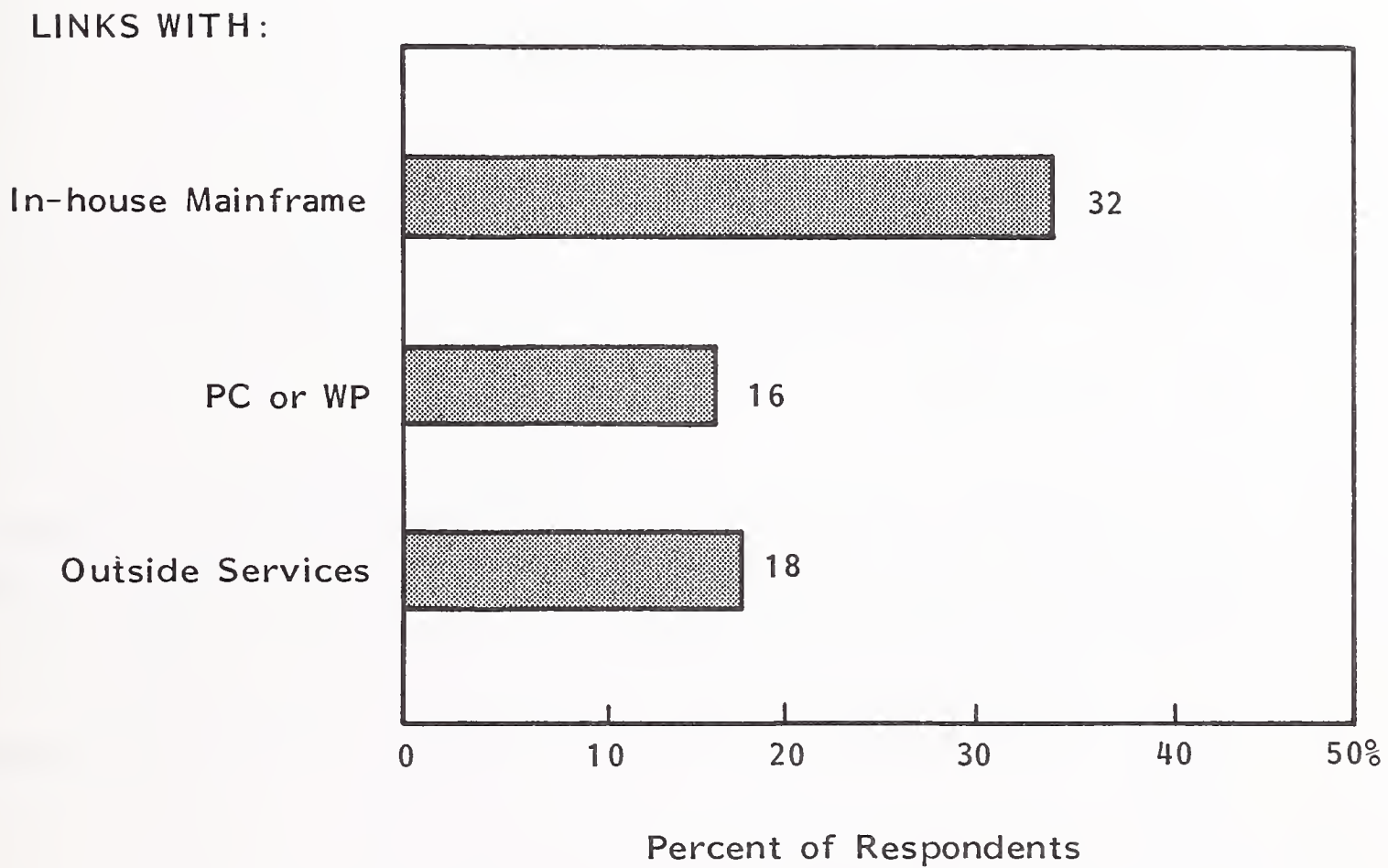
Compound annual growth rate, 1983-1986: 49%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-10

CURRENT PC COMMUNICATION
IN THE DISCRETE MANUFACTURING SECTOR



Percent of PCs linked with other systems: 2%

SOURCE: INPUT Survey

C. PROCESS MANUFACTURING SECTOR

I. INDUSTRY OVERVIEW

a. Chemicals

- Overall utilization fell to 65%-70% of capacity, and prices fell during 1982. Capacity utilization is especially important in this capital-intensive industry, and its participants have slashed capital expansion programs to meet the problems of over supply.
- Companies have also worked to lower break-even points by cutting costs and streamlining operations. They have also pared their debt levels.

b. Petroleum

- The worldwide recession and energy conservation caused demand and prices to fall last year. Heavy reliance on expensive OPEC and hard-to-get domestic oil also placed pressure on margins.
- Oil firms have reacted by modernizing refineries and closing the marginal ones.
- Surplus capacity in almost every phase of the industry has resulted in the most intensive competition in recent memory, further depressing profit margins. 1983 demand is expected to increase only 1%, and the long-term demand outlook is not promising.

c. Paper Products

- Several paper companies completed major expansion projects last year - just in time for the worst part of the depression. Demand and prices for uncoated

stocks slid throughout the year, but demand for lightweight coated paper remained steady - supported by the printing industry.

- Companies improved cash flow by curtailing operations and reducing employment. With most capital projects now completed, the paper products companies should do well in the years ahead; they have emerged from the recession.

d. Rubber and Plastics

- Dwindling demand for original-equipment tires in 1982 was partially offset by emphasis on the replacement markets. But the tire manufacturers are not satisfied with growth prospects in their own industry and are actively diversifying - mainly into energy. Still, new-tire demand is expected to grow 10% to 20% this year, helping earnings grow.

e. Stone, Glass, and Clay

- In the light of the constriction in the stone, glass, and clay industry's major markets - autos and construction - this industry has not performed too badly. The auto parts replacement market did especially well last year.
- Producers resorted to internal changes to meet the challenge of the recession: efforts were made to improve liquidity and reduce debt, marginally profitable businesses were eliminated, and diversification was stepped up. Despite the downturn, previously planned expansion projects and R&D expenditures were continued.

f. Primary Metals

- Steel production, shipments, employment, and operations in general fell to their lowest levels since 1938, and only a modest improvement is expected in the near future. Utilization fell as low as 30% of capacity. World "spot" steel

export prices remained 35% below domestic list prices, and imports were largely unrestrained, increasing price pressures.

- Other metals did not fare much better; aluminum production last year averaged about 55% of capacity, copper 38%, and lead and zinc from 40% to 50%. Many firms sustained large losses and few did respectably. There is some concern about an all-out international trade war, and this further depressed prices. In any case, metals will not share a large part of the recovery and should remain weak for the foreseeable future.

2. BUDGET ANALYSIS

- In the process manufacturing sector, 82% of the companies expect information systems budgets to increase in 1984, 11% expect budgets to remain the same, and 7% expect budgets to decline.
 - The average expectation for budget growth in 1984 is 5%. This average expectation for all industries is 7%.
 - In 1983, budget growth has also been 5%.
- Exhibit IV-11 shows the distribution of expenses in process manufacturing information systems budgets.
- The breakdown of expenses in this sector varies considerably from the average for all industries (Exhibit III-9).
 - Less than half as much is spent on maintenance.
 - Software expenses are also relatively low.
 - Process manufacturers spend much more on mainframes than they do on mini and microcomputers. They also have greater than average peripheral expenses.

EXHIBIT IV-11

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE PROCESS MANUFACTURING SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	44.9%	4.1%
Mainframe Processors	9.8	(0.8)
Minicomputers	1.7	7.1
Micro-personal Computers	1.9	5.3
Terminals	3.1	2.5
Peripherals	10.5	(2.6)
Total Hardware	27.0%	4.5%
Communications	9.6	(0.1)
External Software	1.9	21.8
Custom Programming	2.3	25.1
Integrated Systems	0.1	0.0
Total Software	4.3%	20.5%
Software Maintenance	0.7	2.6
Hardware Maintenance	1.6	5.4
Total Maintenance	2.4%	5.2%
Outside Processing Services	0.3	(8.0)
Other	11.5	5.8
Total	100.0%	4.9%

- The largest increase in spending is for software, expected to climb 20% in 1984.
 - An 8% drop in outside processing services spending is projected.
 - Mainframe and peripheral expenses will also drop.
 - Minicomputer spending will increase 7%, microcomputer spending 5%.
- The information systems budget as a percent of total process manufacturing company revenue is .6% in 1983. The comparable figure for all industries is .9%.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Cost, the leading concern of senior managers in almost all sectors, is rated particularly high by process manufacturing executives, as can be seen in Exhibit IV-12.
- Hardware, however, was rated only half as important to process manufacturing executives as it was to executives in other sectors. Personnel issues were also rated much lower than they were in other sectors.

b. Problems

- Process manufacturing senior information systems managers rate corporate relations as their top problem, as shown in Exhibit IV-13. Corporate relations issues are especially important to them.
- In general, processing manufacturing concerns parallel the industry norms.

EXHIBIT IV-12

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE PROCESS MANUFACTURING SECTOR

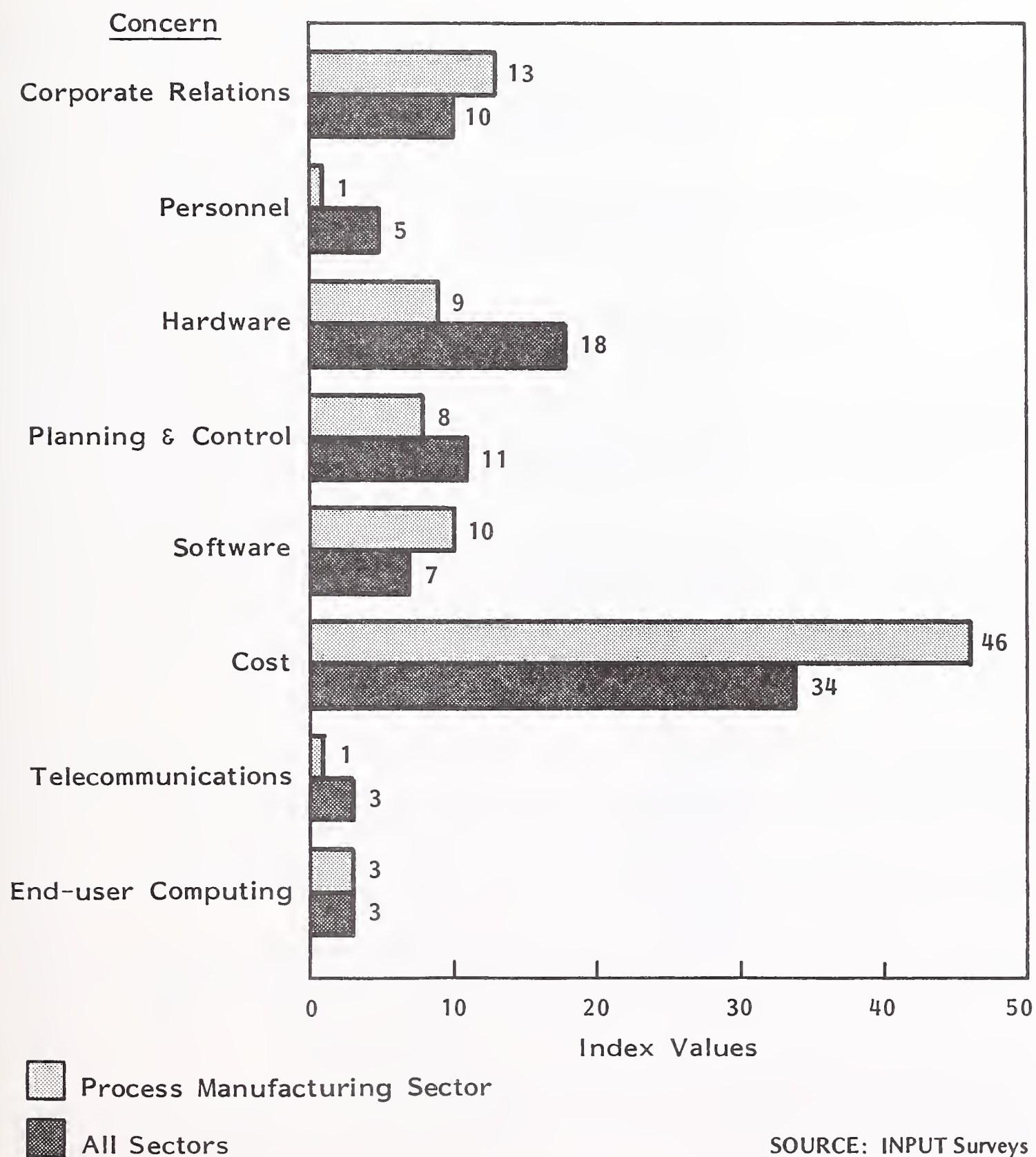
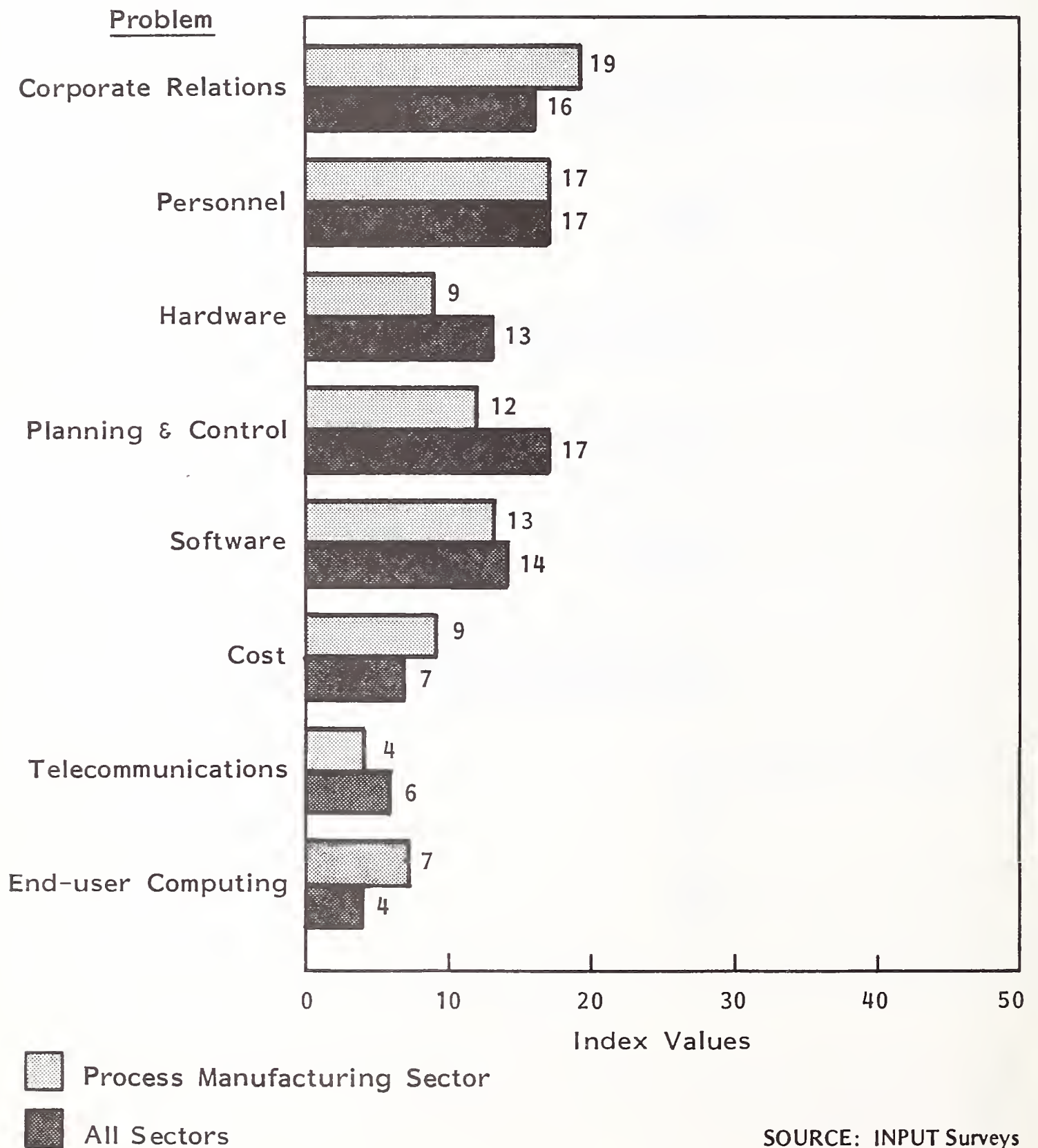


EXHIBIT IV-13

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS IN THE PROCESS MANUFACTURING SECTOR (IMPORTANCE TO I.S. MANAGERS)



- Personnel issues take second place, followed by software, and planning and control. Staff shortages cause the greatest concern within the personnel category.
- Concern about costs, particularly budgets, ranks higher here than it does in any other industrial sector.
- Telecommunications generates the least interest.
- Exhibit IV-14 shows the planning issue subgroups that were rated as top problems by process manufacturing IS managers.

c. Objectives

- Process manufacturers rate software objectives as their number one priority. Corporate relations, the next highest priority, draw a third as much interest, as shown in Exhibit IV-15.
 - Software applications objectives are considered particularly important.
 - This emphasis on software objectives contrasts with the relatively low regard for software problems.
- Hardware objectives, rated next in importance, nevertheless have a valuation that is still way below the industry average. Special importance is attached to meeting hardware upgrade objectives.
- Corporate relations objectives are a relatively low priority considering the concern expressed for corporate relations problems.
- Telecommunications objectives are rated of lowest importance - in stark contrast to the relative importance attached to telecommunications problems.

EXHIBIT IV-14

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
PROCESS MANUFACTURING INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

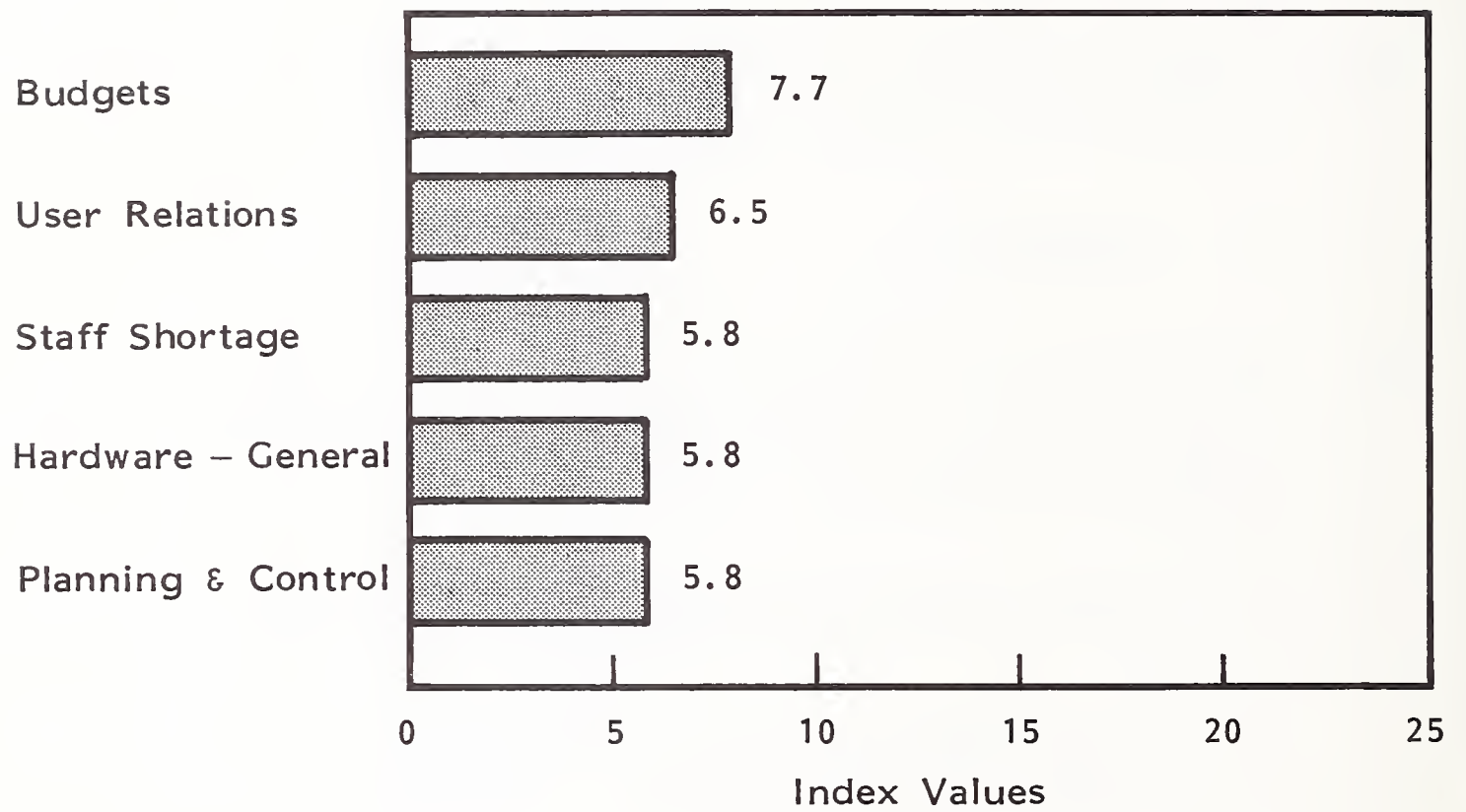
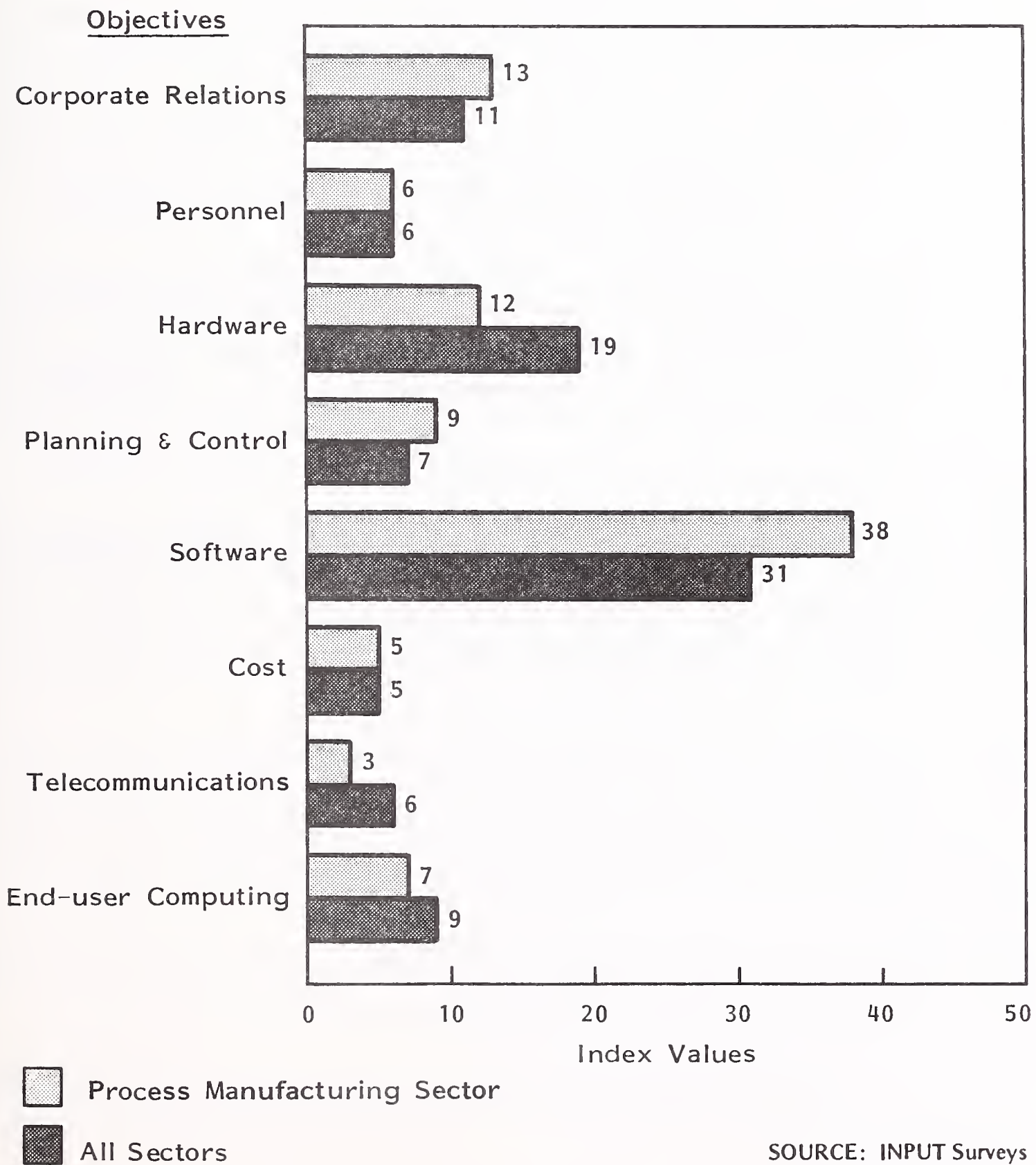


EXHIBIT IV-15

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES
IN THE PROCESS MANUFACTURING SECTOR
(IMPORTANCE TO I.S. MANAGERS)



- Exhibit IV-16 displays the planning issues subgroups that process manufacturing IS managers rated as their top objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the process manufacturing industry are shown in Exhibit IV-17. Fifty-nine percent of the respondents said that they will be developing cross-industry applications, while the remaining 41% said they will be developing industry-specific applications.
- More information systems managers plan to develop material requirements planning applications than any other industry-specific application. Also being considered for 1984 are inventory control applications. Other applications specific to process manufacturing include manufacturing systems and quality control monitoring.
- Many information systems managers expect to develop payroll, order entry, and accounts receivable applications in the next year. Although the respondents gave these particular examples, applications for the process manufacturing industry will in general be order entry and accounting applications.
- The most significant events affecting applications development within the companies interviewed were software upgrades and the implementation of manufacturing control systems. Also noted as significant was the addition of data base management systems and application development tools.
- Information systems managers in the process manufacturing industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.

EXHIBIT IV-16

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
PROCESS MANUFACTURING INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

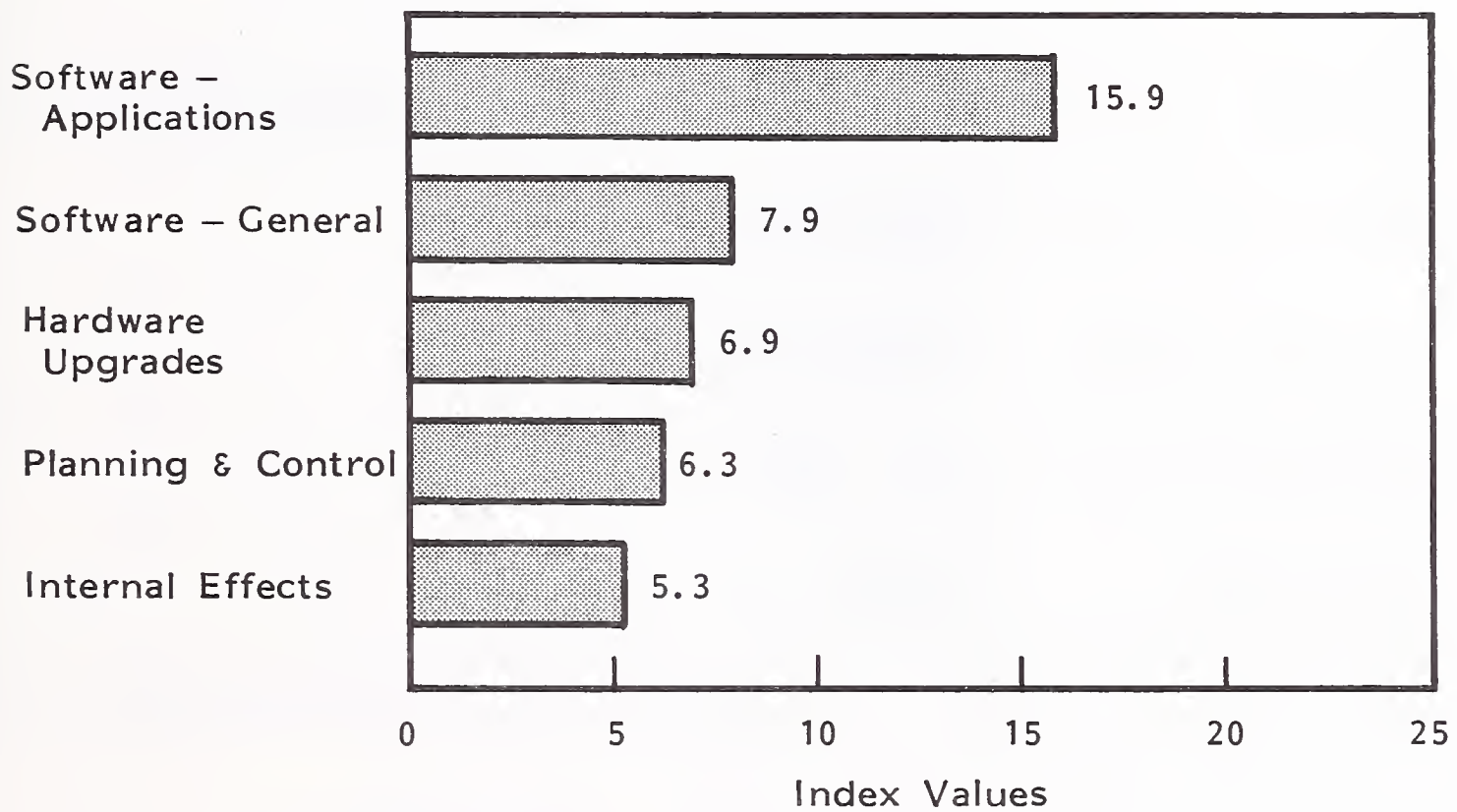
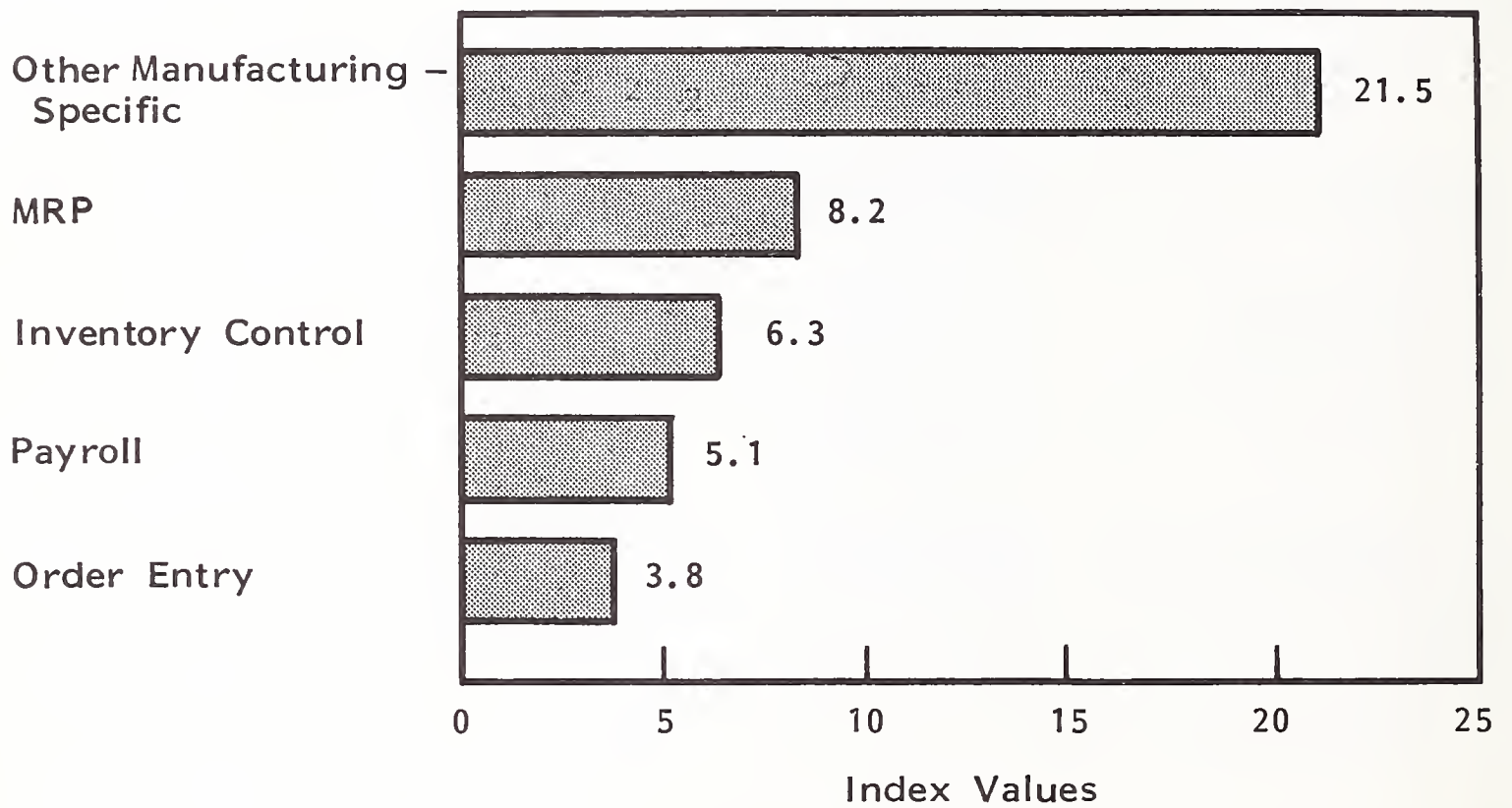


EXHIBIT IV-17

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS FOR THE PROCESS MANUFACTURING INDUSTRY (IMPORTANCE TO I.S. MANAGERS)



- Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the process manufacturing industry was the recession. Personal computers also affected applications development in the process manufacturing industry.

5. END-USER COMPUTING

a. Office Systems

- The most dramatic office systems application growth in the process manufacturing sector will be seen in electronic mail and local-area networks, which are both now used by a fifth of our respondents but which another third intend to be using by the end of 1984.
- The most pervasive office system product is the word processor. Telecopiers and facsimile devices, and PBXs are also in more of our respondents' workplaces than not.
- Televideo conferencing is not widely used within process manufacturing companies, as shown in Exhibit IV-18.

b. Personal Computers

- Over nine-tenths of our respondents in the process manufacturing sector report personal computers in their organizations. On average, there are 39 PCs in each organizational entity; by 1986, there will be 190, reflecting a compound annual growth rate of 70%, as shown in Exhibit IV-19.
- About 9% of the personal computers in this sector communicate with other devices. Over a third of our respondents report some links with in-house mainframe computers, three-tenths report links with other personal

EXHIBIT IV-18

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE PROCESS MANUFACTURING INDUSTRY

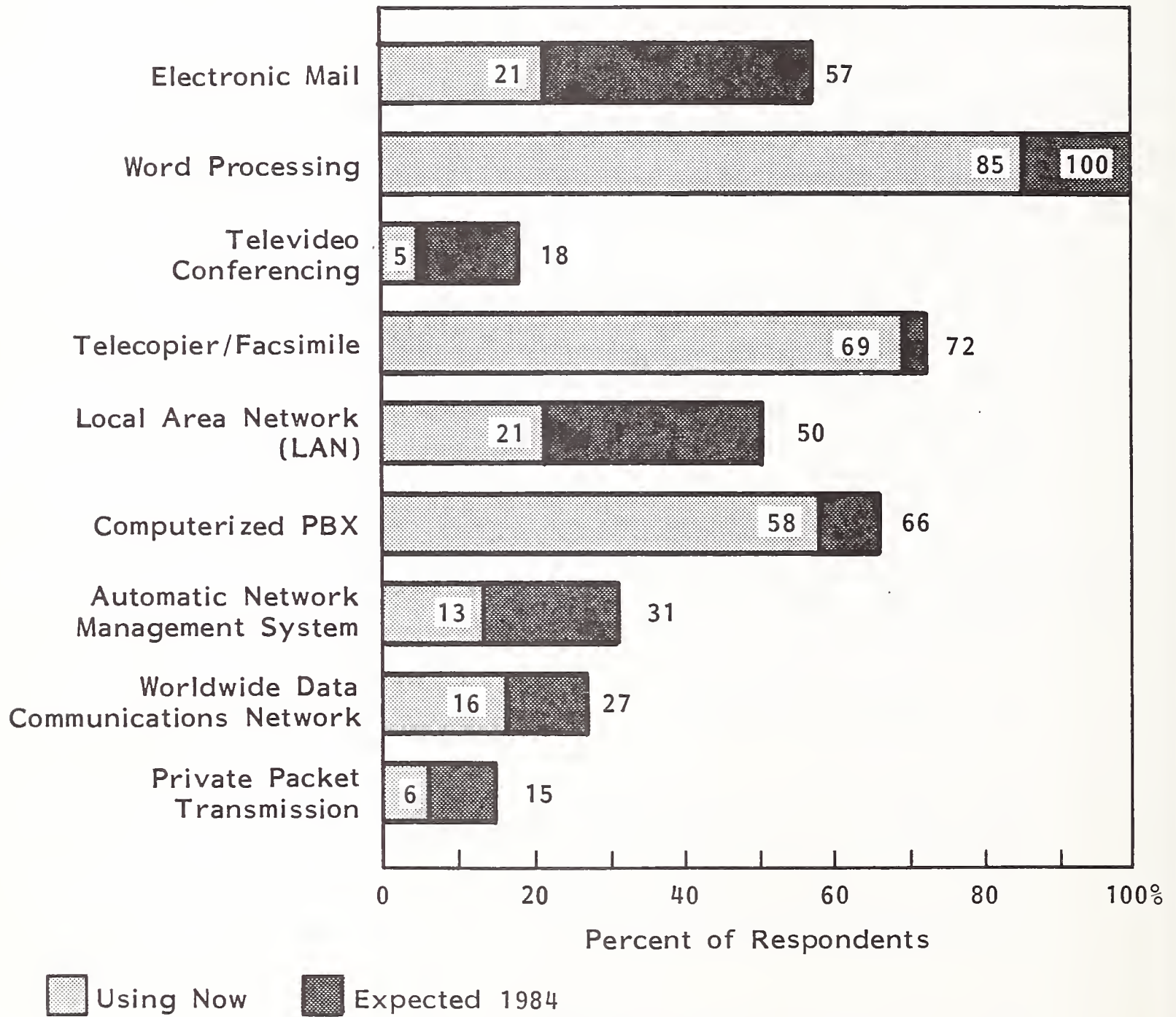
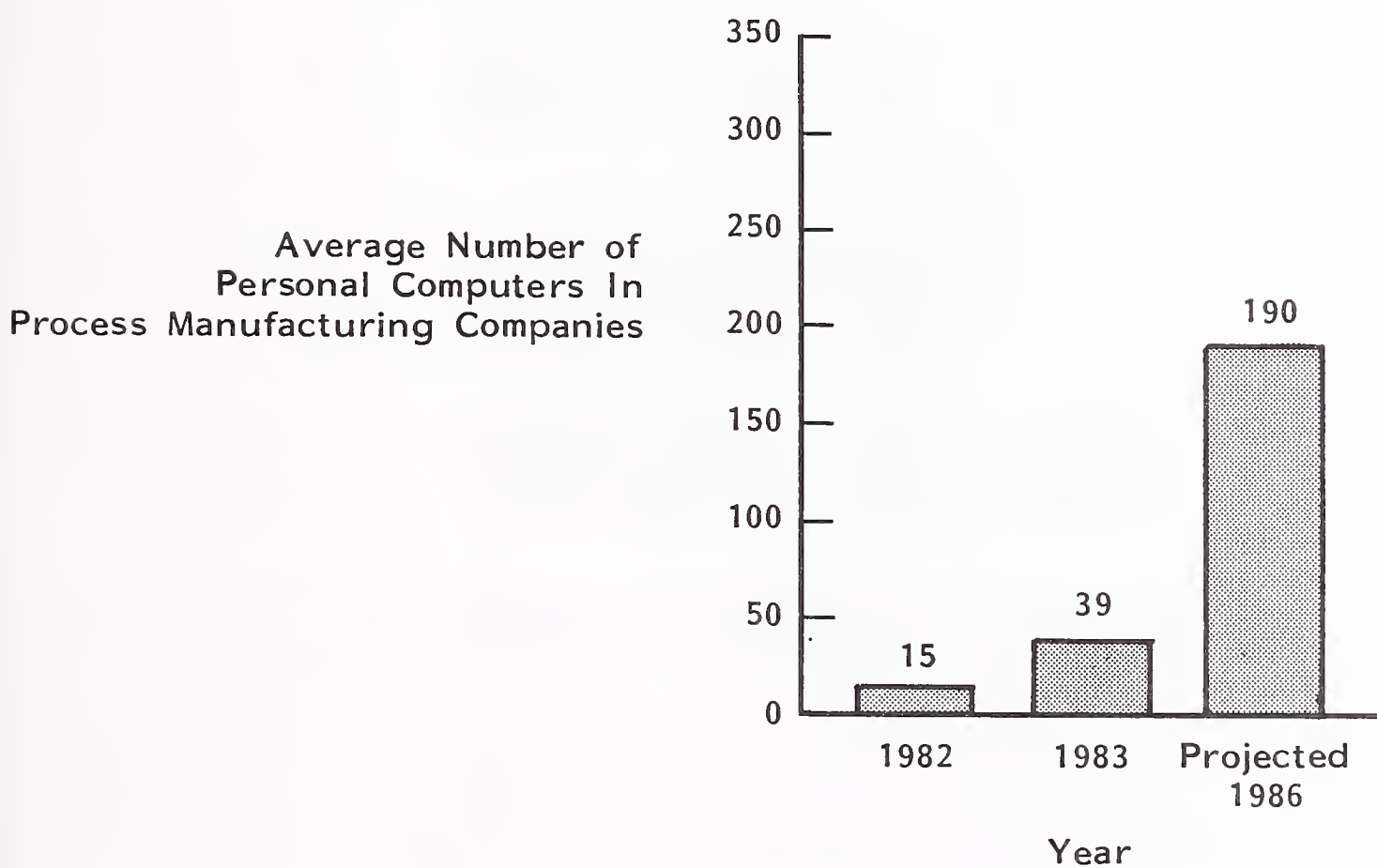


EXHIBIT IV-19

NUMBER OF PERSONAL COMPUTERS IN
PROCESS MANUFACTURING SECTOR COMPANIES



Compounded annual growth rate, 1983-1986: 70%

* Respondent Estimates

SOURCE: INPUT Survey

computers or word processors, and over a third have PCs communicating with outside services, as shown in Exhibit IV-20.

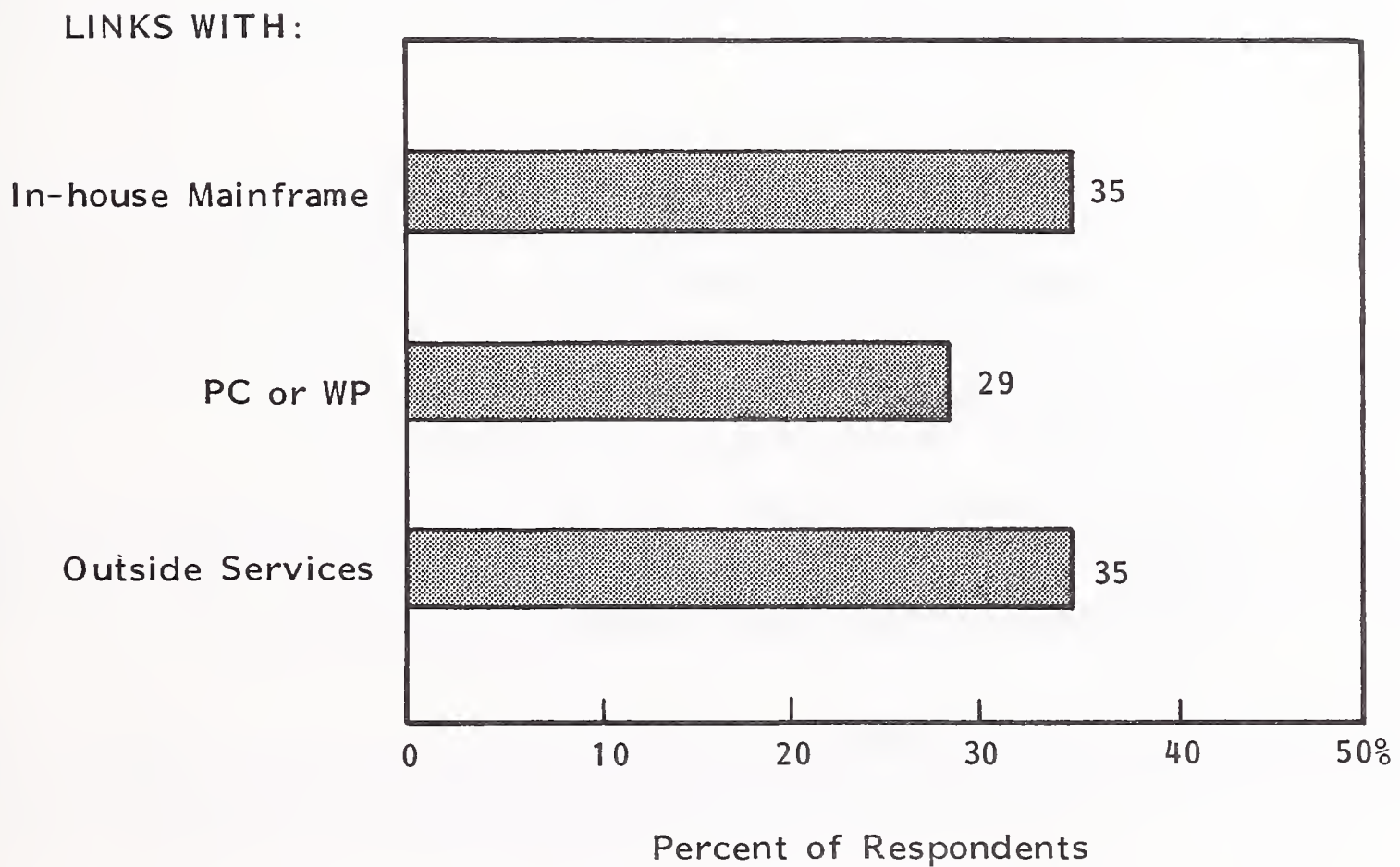
D. TRANSPORTATION SECTOR

I. INDUSTRY OVERVIEW

- The trucking industry is in a state of rapid change, the salient features of which are increased competition, weak carrier financial positions, and pressures to reduce costs.
 - Due in large part to the 1980 passage of the Motor Carrier Act, which, along with a pro-competitive Interstate Commerce Committee made entry into the industry much easier, the number of motor vehicle carriers has increased from 17,000 in 1979 to 25,000 in 1982. This has contributed to the 26% average drop in prices for truckload shipments since 1978.
 - The drop in prices has increased pressures to improve efficiency and has reduced the power of labor unions to resist automation. The drop can be expected to weaken the traditional conservatism of trucking executives toward innovative information services, a conservatism that could be comfortably maintained in a protected environment but which must now yield to practicalities.
 - At the same time, improvements in information technologies have increased the scope of applications available to truckers and lowered their costs.
- A similar deregulated environment confronts the railroad industry, but has produced generally healthier results.

EXHIBIT IV-20

CURRENT PC COMMUNICATION
IN THE PROCESS MANUFACTURING SECTOR



Percent of PCs linked with other systems: 9%

SOURCE: INPUT Survey

- The 1980 Harley O. Staggers Act allowed much more freedom in rate-setting and routing. This flexibility is enabling railroaders to pick up some of the business they have lost over the years to truckers.
- It has also led to much more aggressive marketing and pricing - and more rapid changes in rate setting, requiring sophisticated systems simply to keep track of changes. Indeed, the ICC is now planning implementation of an electronic tariff filing system in an effort to keep up.
- Meanwhile, railroaders are growing more innovative, particularly in the development of new freight cars, but also in the use of information systems, which are now being employed to keep track of freight cars and other equipment and to electronically block off sections of track under repair.
- Established airlines are doing poorly in their newly deregulated environment. This is because their variable costs are often twice that of their upstart competitors due to inefficiency and much higher labor costs.
 - The smaller airlines, however, are rapidly expanding this service. Basic economics supports the continued growth and success of smaller airlines.
 - Industry operating losses were \$602 million in the first three months of 1983, but passenger traffic on scheduled flights was up 16% over 1982, indicating better prospects for industry recovery.
 - There is a possibility that airline-sponsored automated reservation systems such as American Airline's Sabre and United Airline's Apollo will be divested by order of the government.

- The bus industry is the last major segment of the U.S. transportation industry to be deregulated. Though the act accomplishing deregulation went into effect at the end of 1982, it is only now beginning to have any impact on routes and rates. On balance, its effect on the industry will parallel that of railroad deregulation.

2. BUDGET ANALYSIS

- In the transportation sector 78% of the companies expect information systems budgets to increase in 1984, and 22% anticipate stable budgets. None expect decreases.
 - The average expectation for budget growth in 1984 is 10%. This is above the 7% average expectation for all industries.
 - This is a marked change from budget performance in 1983, when spending on information services is reported as declining 1%.
- The information systems budget as a percent of total transportation company revenue is 2.1% - much higher than the .9% average for all industries.
- Exhibit IV-21 shows the distribution of expenses in transportation sector information systems budgets. This breakdown varies considerably from the average for all industries (Exhibit III-9).
 - Spending on terminals and communications is more than twice as high in this sector.
 - Much lower expenses than normal are reported for hardware maintenance, custom programming, mini and microcomputers, and outside processing services.

EXHIBIT IV-21

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE TRANSPORTATION SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	45.5%	7.0%
Mainframe Processors	8.8	15.4
Minicomputers	1.4	4.2
Micro-personal Computers	0.6	3.1
Terminals	8.9	7.6
Peripherals	6.4	9.3
Total Hardware	26.2%	7.9%
Communications	15.6	15.2
External Software	3.3	7.3
Custom Programming	1.8	5.0
Integrated Systems	0.0	0.0
Total Software	5.0%	6.5%
Software Maintenance	2.0	6.7
Hardware Maintenance	0.4	7.9
Total Maintenance	2.4%	6.9%
Outside Processing Services	1.4	4.9
Other	3.9	7.4
Total	100.0%	9.8%

- Easily the largest increase in spending projected for 1984 is in mainframe computers, which should climb 15%.
 - Other fast-growing budget items are terminals, peripherals, and hardware maintenance.
 - Spending growth in microcomputers, minicomputers, integrated systems, and outside processing services will be relatively slow.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Transportation sector senior executives break the mold by rating cost only their second greatest information services concern. Their most pressing issue is hardware, as shown in Exhibit IV-22.
 - The primary reason for this emphasis on hardware is the importance of communications in the transportation sector. Communications are very hardware intensive.
 - Costs are still considered to be about as important as they are in most other industries; other issues are not considered as pressing, however.
- Software is considered of very little import by these executives, and corporate relations are also not thought to be important.

b. Problems

- Senior information systems managers in transportation companies express their greatest concern as planning and control problems, especially backlogs, as shown in Exhibit IV-23. Telecommunications, planning and control, and software issues are rated by this sector as significantly more important issues than they are by other sectors.

EXHIBIT IV-22

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE TRANSPORTATION SECTOR

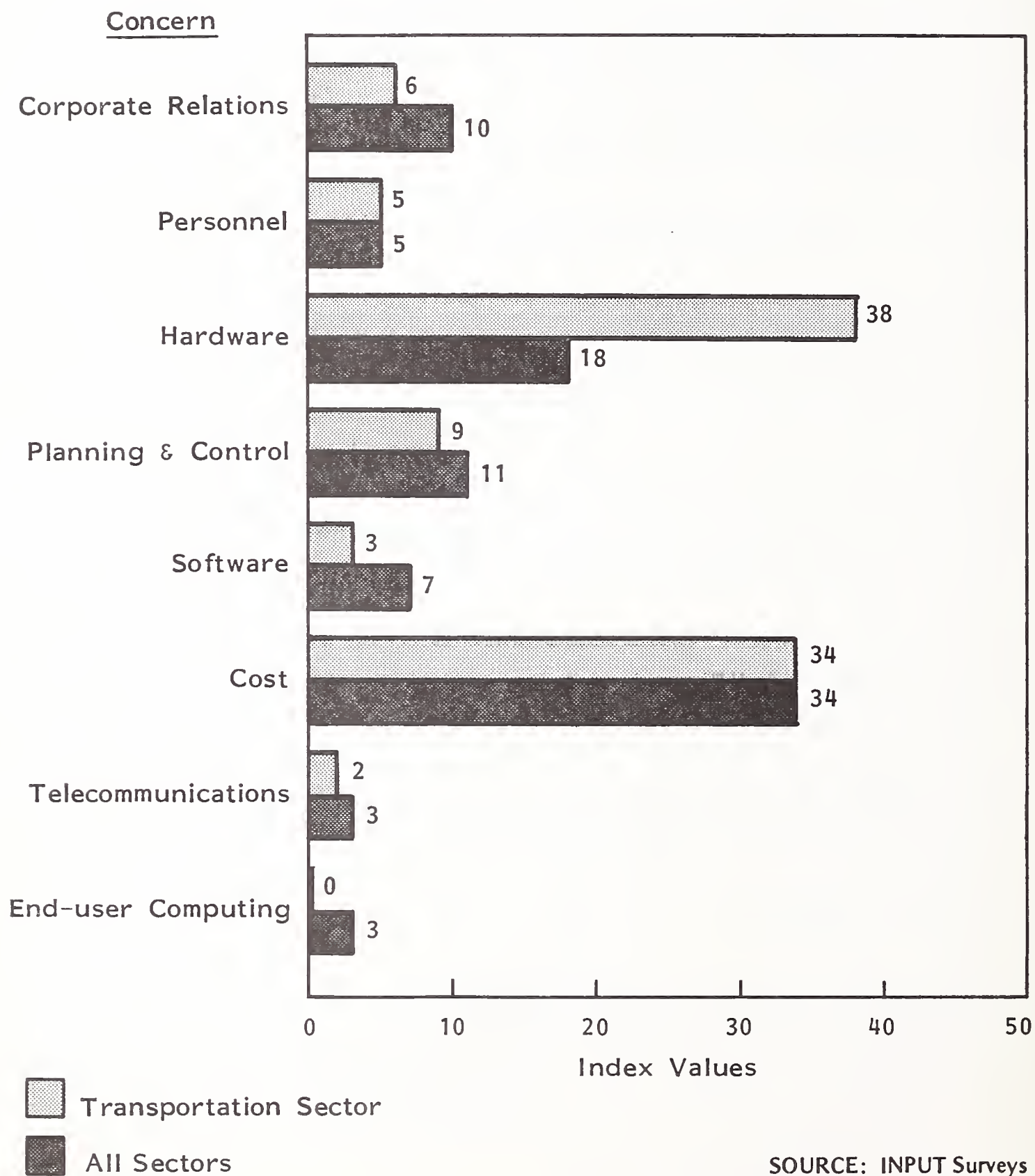
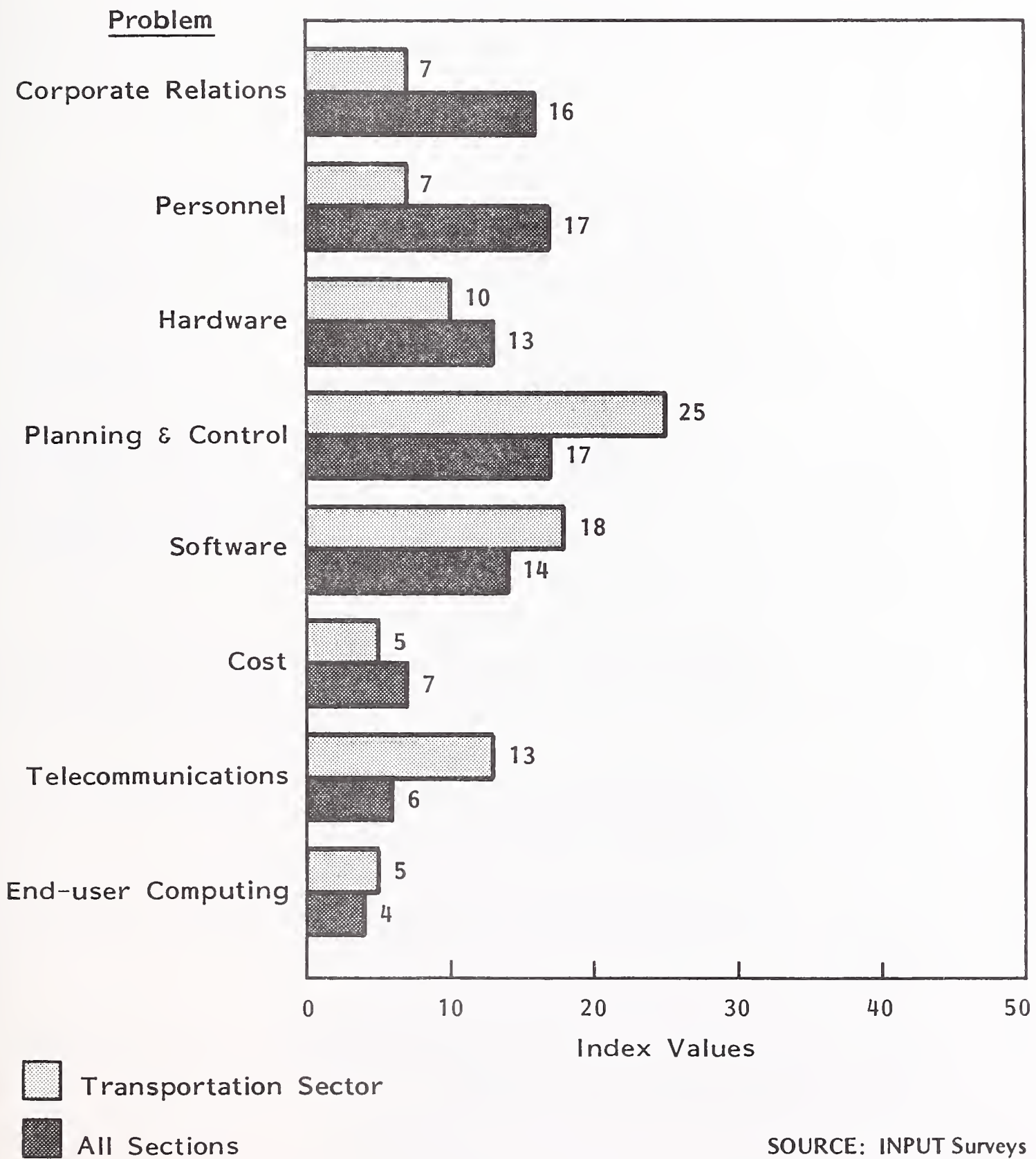


EXHIBIT IV-23

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE TRANSPORTATION SECTOR
(IMPORTANCE TO I.S. MANAGERS)



- The above concerns are in stark contrast to issues raised by senior management in Exhibit IV-22. In particular, information systems managers rate senior managers' top two concerns - hardware and costs - very low, suggesting conflicting goals.
- The transportation industry views telecommunications problems as of greater concern than does any other sector, which reflects this industry's reliance on communications. Corporate relations and personnel issues cause little anguish.
- Exhibit IV-24 shows the planning issue subgroups that were rated as top problems by transportation IS managers.

c. Objectives

- Just as in almost all other sectors, transportation information systems managers rate accomplishment of software objectives as their highest priority, as shown in Exhibit IV-25. Hardware goals are also rated high, reflecting senior management concerns.
- Cost and telecommunications objectives are placed particularly high by the transportation sector. On the other hand, end-user objectives rate very low.
- Planning and control objectives also rate low, in a strong contrast with the importance accorded planning and control issues.
- End-user computing objectives are considered to be of little impact by this sector.
- Exhibit IV-26 lists the planning issue subgroups that transportation IS managers rate as their top objectives.

EXHIBIT IV-24

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
TRANSPORTATION INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

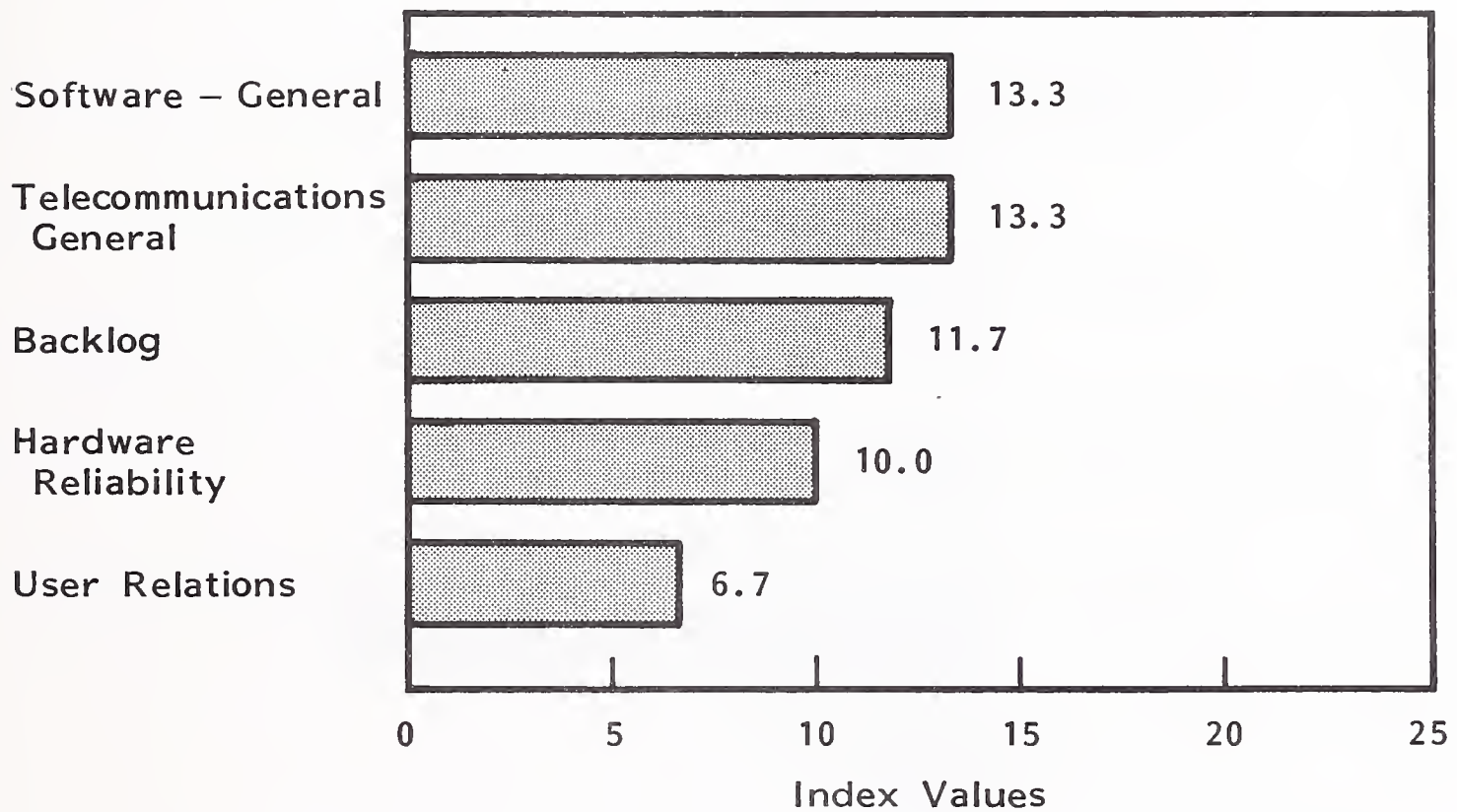


EXHIBIT IV-25

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES IN THE TRANSPORTATION SECTOR (IMPORTANCE TO I.S. MANAGERS)

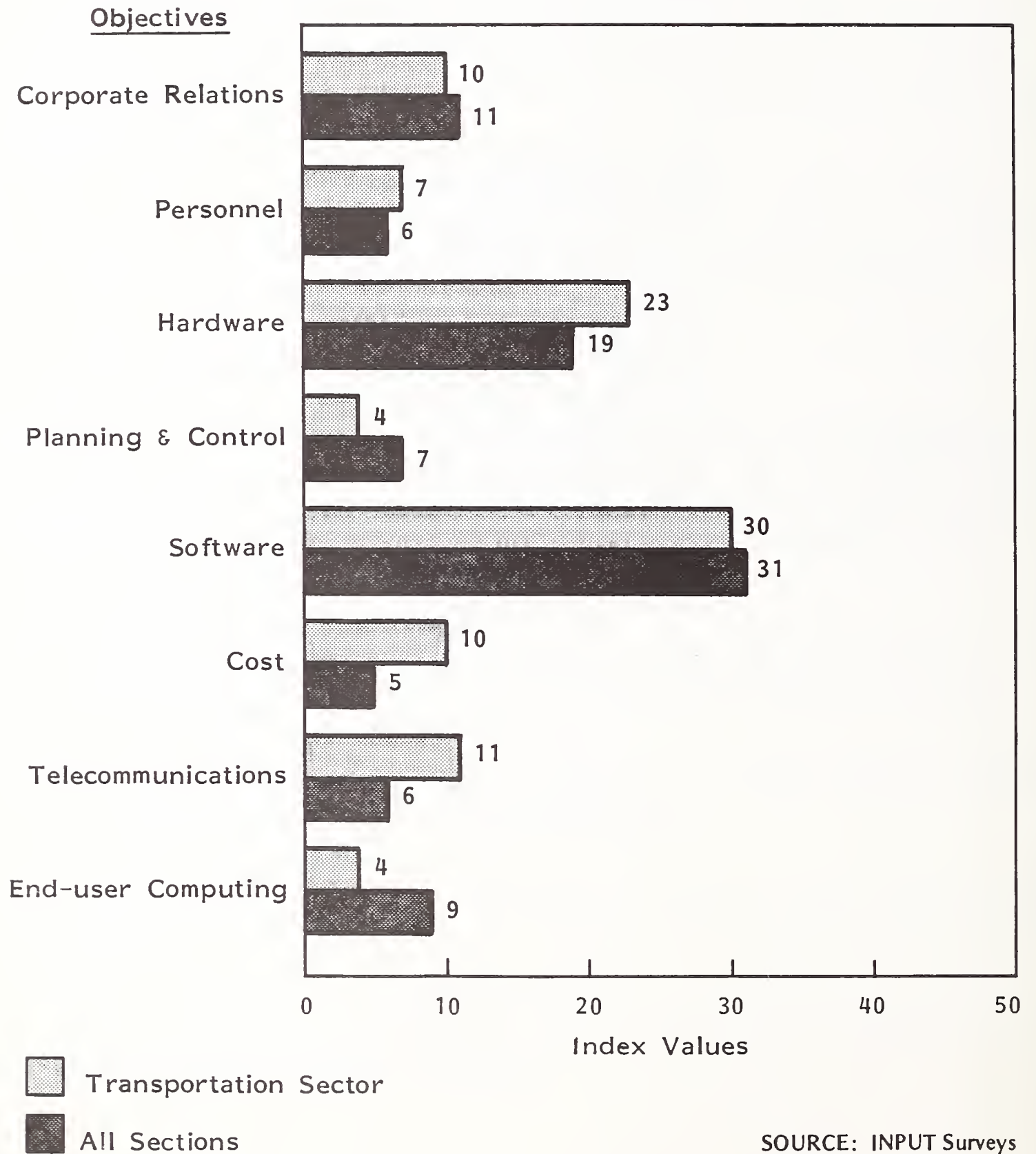
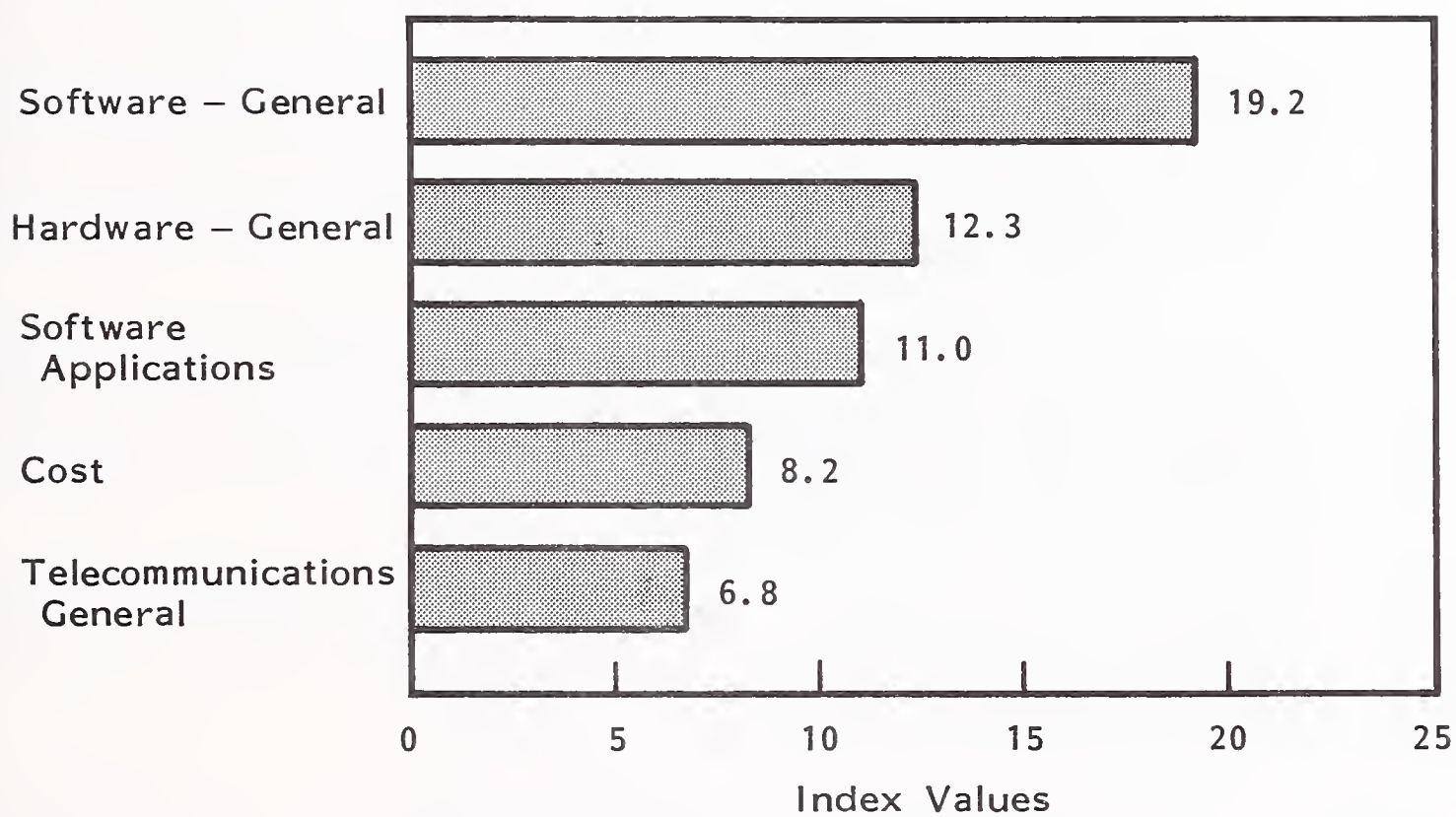


EXHIBIT IV-26

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
TRANSPORTATION INDUSTRY
(IMPORTANCE TO U.S. MANAGERS)

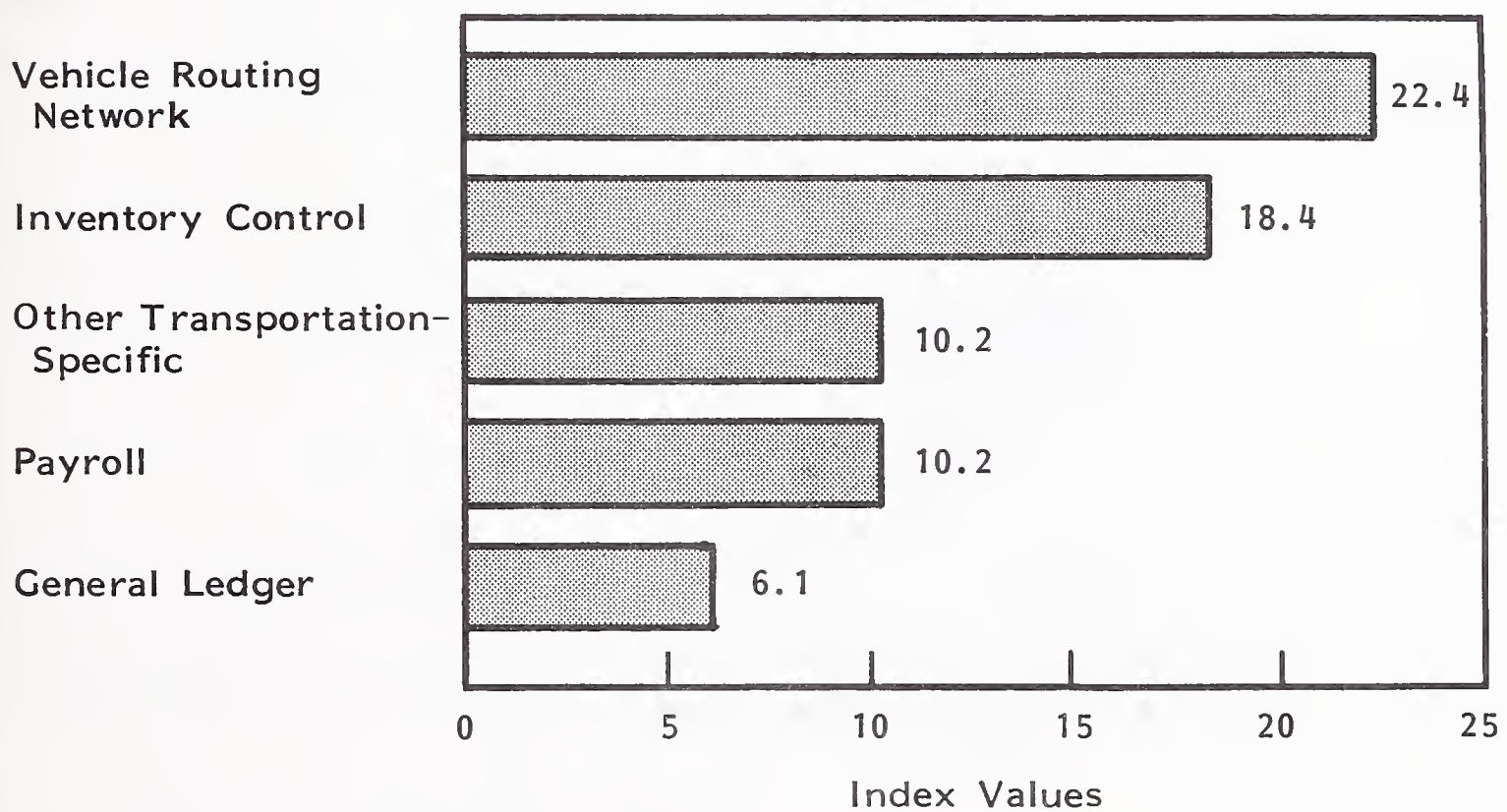


4. APPLICATIONS

- The top five information systems applications planned by IS managers in the transportation industry are shown in Exhibit IV-27. Fifty percent of the respondents said that they will be developing cross-industry applications, while the remaining half said they will be developing industry-specific applications.
- The majority of information systems managers plan to develop route monitoring systems. Also being considered for 1984 are inventory control applications. Other transportation-specific applications include travel processing and shipment costing. In cross-industry applications, information systems managers expect to develop payroll and general ledger applications in the next year.
- The most significant item affecting applications development within the companies interviewed was software upgrades. Also noted as significant were shortages of personnel and the need for training.
- Information systems managers in the transportation industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the transportation industry was government deregulation. Personnel shortages and backlogs also affected applications development in the transportation industry.

EXHIBIT IV-27

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE TRANSPORTATION INDUSTRY
(IMPORTANCE TO U.S. MANAGERS)



5. END-USER COMPUTING

a. Office Systems

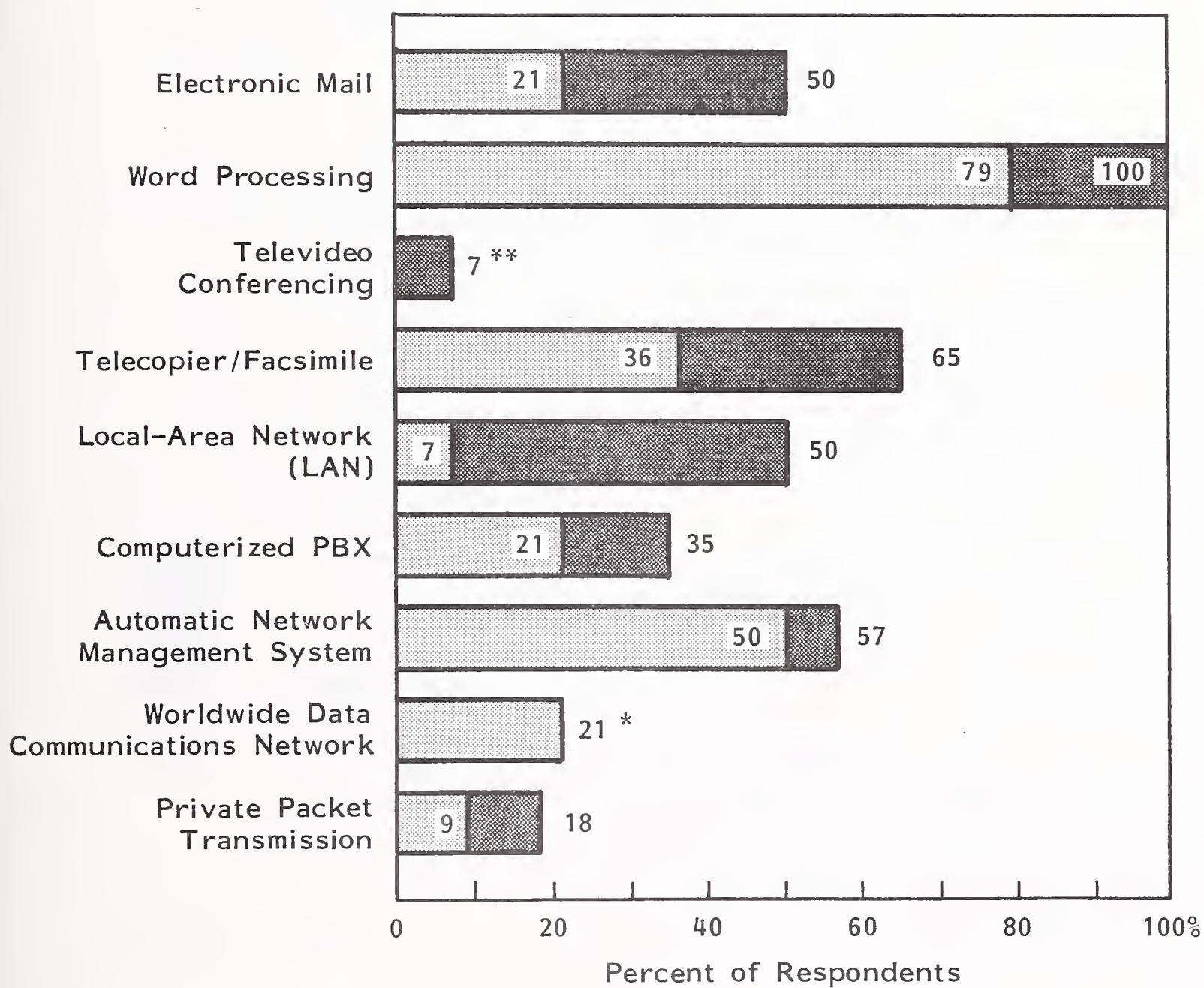
- Growth in local-area networks will be especially strong in the transportation sector in 1984, with over two-fifths of our respondents reporting that they are not using them now but are planning to use them by the end of 1984. Figures can be seen in Exhibit IV-28. Less than a tenth use LANs now.
- Word processors already enjoy very high market penetration, and by the end of 1984 all our respondents plan to be using them. About half (an unusually large amount) are now using automated network management systems.
- Very few companies are using or intend to use televideo conferencing. PBX installations are also relatively low. (See Exhibit III-27.)

b. Personal Computers

- Over nine-tenths of our respondents in the transportation sector report personal computers in their organizations. On average, there are nine PCs in each organizational entity; by 1986, there will be ninety-three, reflecting a compound annual growth rate of 118%, as shown in Exhibit IV-29.
- About 13% of the personal computers in this sector communicate with other devices. Almost a quarter of our respondents report some links with in-house mainframe computers, less than a tenth report links with other personal computers or word processors, and just under a sixth have PCs communicating with outside services, as shown in Exhibit IV-30.

EXHIBIT IV-28

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE TRANSPORTATION INDUSTRY (percent of respondents)



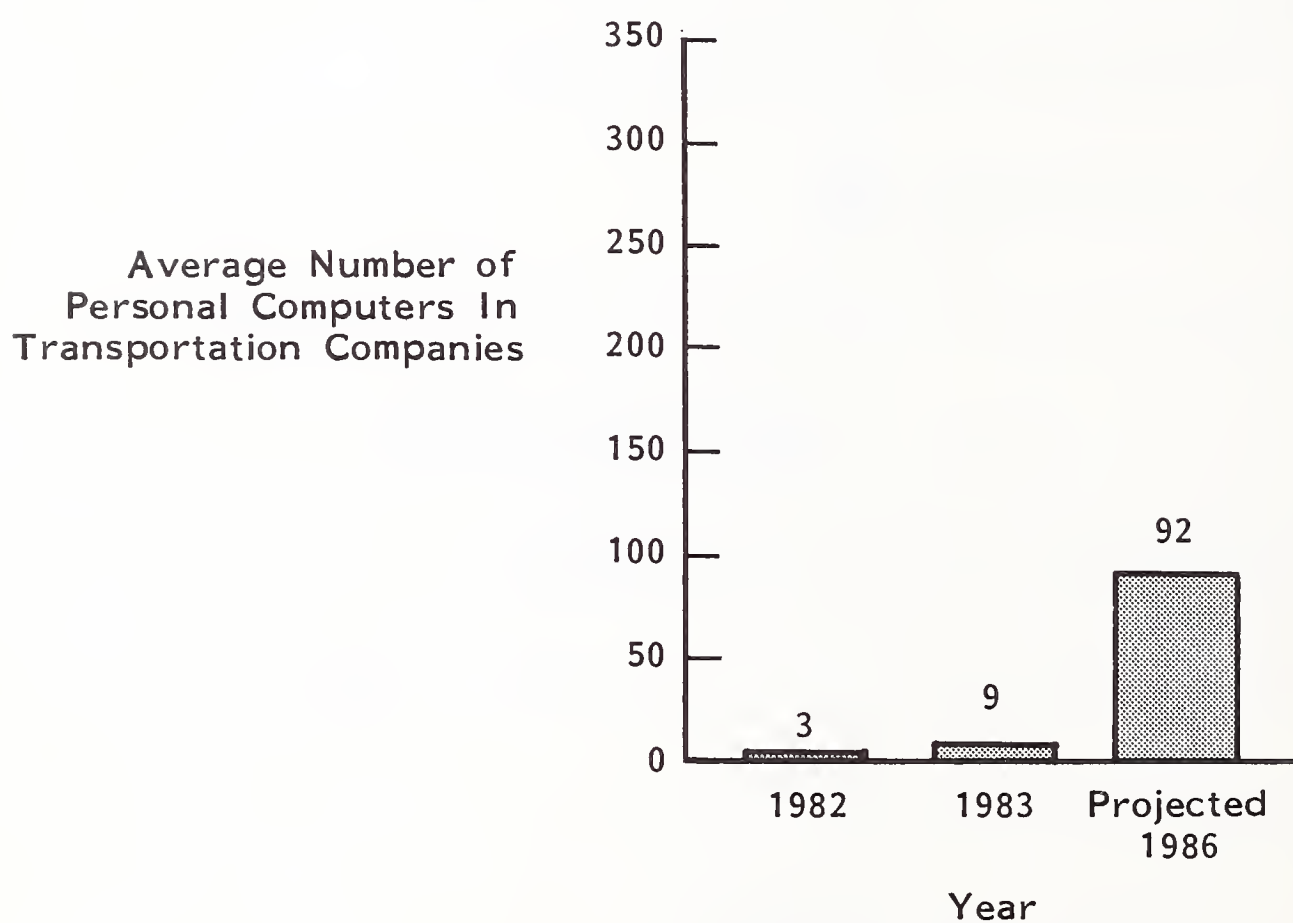
Using Now Expected 1984

* No Change 1984

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EXHIBIT IV-29

NUMBER OF PERSONAL COMPUTERS IN
TRANSPORTATION SECTOR COMPANIES



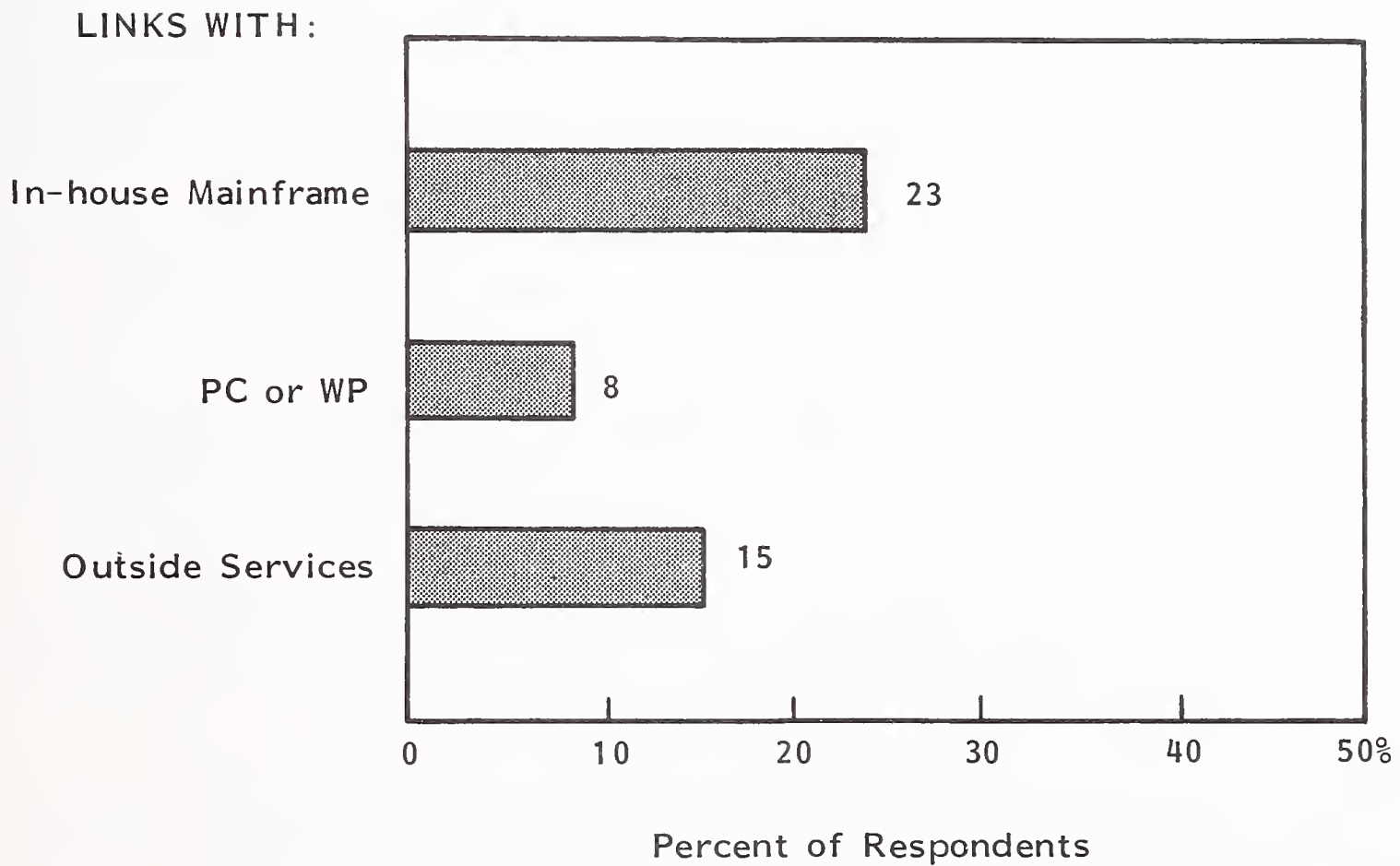
Compound annual growth rate, 1983-1986: 118%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-30

CURRENT PC COMMUNICATION
IN THE TRANSPORTATION SECTOR



Percent of PCs linked with other systems: 13%

SOURCE: INPUT Survey

E. MEDICAL

I. INDUSTRY OVERVIEW

- The following are major medical industry system trends over the next five years.
 - Hospitals have linked different computers by developing expensive interface software for each computer connection. Some hospitals, like University of California Hospitals and Clinics, and York (PA) Hospital have introduced local-area networks (LANs) - cable and personal processor systems that link computers. Commercially designed hospital LANs will be available within 18 months.
 - Greater purchasing of personal computers to be used by ancillary departments, such as laboratory, pharmacy, radiology, and central supply.
 - A significant increase in the use of IBM Personal Computers tied to mainframes.
 - Special emphasis will be placed on the diagnosis-related groups (DRG), the reporting capability of financial systems, and on getting more detailed information about the disposition of hospital data processing dollars.
 - More off-the-shelf data base management systems packages that run on enhanced personal computer systems. Emerging data base systems based in the relational structure will offer physicians the ability to display multi-patient data.

- Accelerated effort toward a new level of hospital automation for the "hospital of the future": robots that will handle such things as cleaning, security, patient monitoring, laboratory testing, and the distribution of hospital supplies.
- Increases in the number of processing-facility management contracts to handle the increasing complexity of information management needs.
- Within the next five years, a medically acceptable commercial medical records software package for the small medical care facility.
- More purchases of applications software packages that are medically oriented.
 - . "At-risk" recall and identification by age, family, and ecology.
 - . For patient education, self-administered questionnaires with individual feedback.
 - . Increasing availability on personal computers of MUMPS programming language and COSTAR data base management system.
- Increasing number of mergers and acquisitions of medical care facilities by major corporations, hospitals, insurance companies, and other medical group practices. By 1988, corporations with 100 medical offices could be standard. The medical manager of such an operation will require a sophisticated information system to bring all the financial and medical data together.
- Increase in hardware-only sales to supply the growing applications software market.

- Increasing use of artificial intelligence systems to aid in medical diagnosis.

2. BUDGET ANALYSIS

- In the medical sector 87% of the organizations expect spending on information systems to increase in 1984, and 13% expect it to decrease.
 - The average expectation for budget growth is 11%. This is a sharp reduction from 1983's 19% growth.
 - The average growth in spending for all industries will be 7% (Exhibit III-9).
- The information systems budget as a percent of total medical organization revenue is 0.9% in 1984 - the same as the average for all sectors.
- Exhibit IV-31 shows the distribution of expenses in medical sector information systems budgets. This breakdown varies considerably from the average for all industries.
 - Spending on minicomputers is over four times as high, even eclipsing mainframes.
 - Spending on mainframes themselves is significantly higher in this sector.
 - Software, maintenance, outside processing services, and communications expenditures are relatively low.
- Large jumps in spending are anticipated on integrated systems, outside services, and communications in 1984.

EXHIBIT IV-31

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE MEDICAL SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	33.7%	4.6%
Mainframe Processors	15.0	5.6
Minicomputers	18.8	20.0
Micro-personal Computers	3.3	52.8
Terminals	5.1	4.5
Peripherals	8.5	13.1
Total Hardware	50.7%	4.5%
Communications	2.6	41.0
External Software	2.5	(5.2)
Custom Programming	1.6	14.5
Integrated Systems	0.3	200.0
Total Software	4.4%	26.6%
Software Maintenance	0.8	8.8
Hardware Maintenance	2.2	9.2
Total Maintenance	3.0%	5.1%
Outside Processing Services	1.0	340.6
Other	4.7	0.7
Total	100.0%	10.6%

- In terms of dollars, the growth in minicomputer spending will be greatest, followed by that for outside processing service area personal computers.
- Spending on external software programming will drop 5%.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Senior managers in the medical sector place an even higher emphasis on costs than do the managers in almost any other sectors. Medical managers also express great concern on planning and control issues, as can be seen in Exhibit IV-32.
- They are not bothered by software issues.

b. Problems

- Medical information services managers rate planning and control as their most important problem, as shown in Exhibit IV-33.
 - Backlogs cause the bulk of this problem.
 - Senior managers are also concerned about this issue.
- The shortage of qualified personnel, software, and corporate relations are other major problems.
- Cost, telecommunications, and end-user problems raise little concern with IS managers in the medical sector.

EXHIBIT IV-32

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE MEDICAL SECTOR

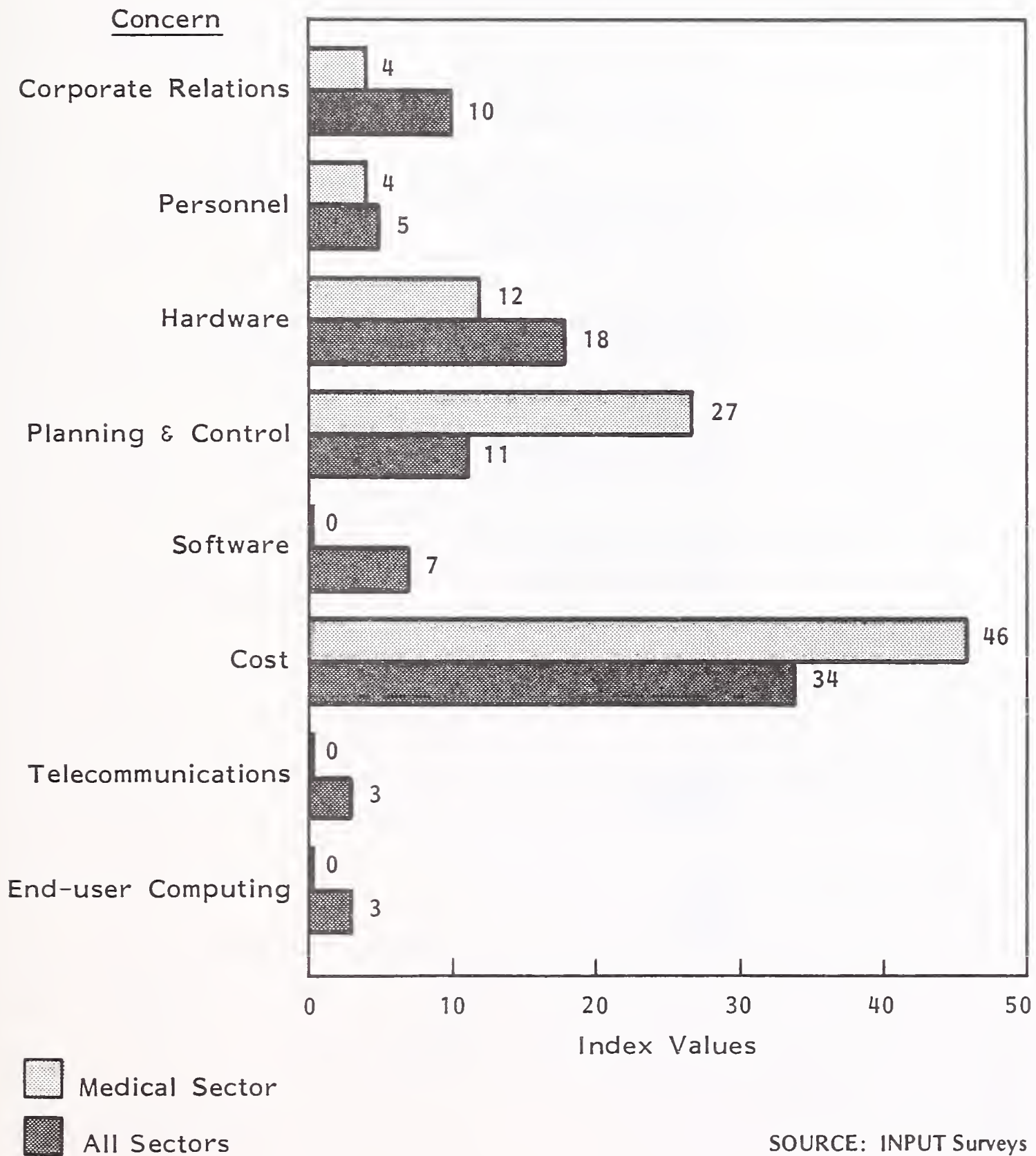
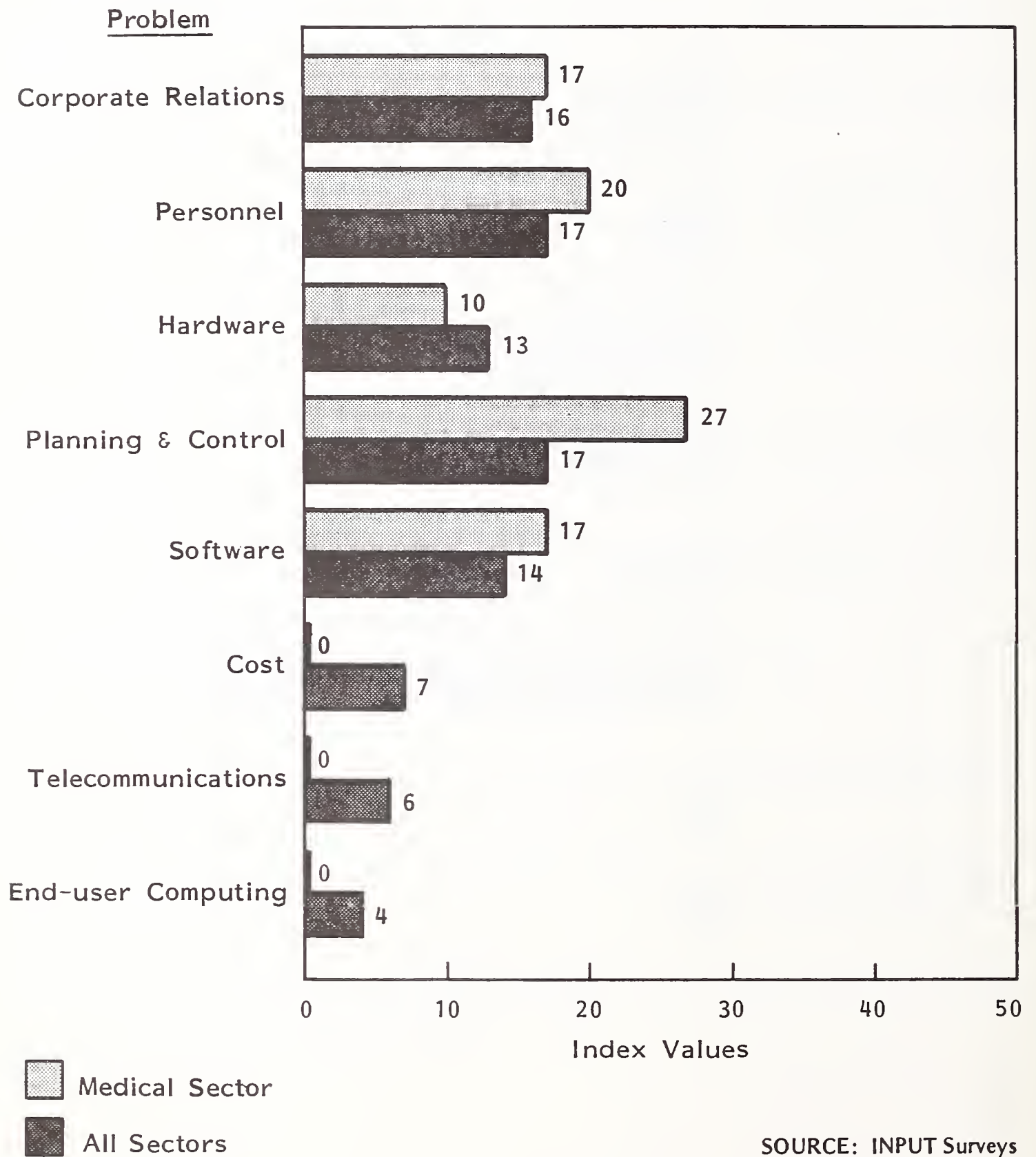


EXHIBIT IV-33

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS IN THE MEDICAL SECTOR (IMPORTANCE TO I.S. MANAGERS)



- Exhibit IV-34 shows the planning issue subgroups that were rated as the top problems by medical IS managers.

c. Objectives

- Software, the major objective in most sectors, is considered particularly important in the medical sector, as shown in Exhibit IV-35. Hardware upgrade objectives are also important, although information systems managers are not too concerned with hardware problems.
- Planning and control objectives are not rated by IS managers as particularly important - in spite of the interest expressed on this issue by senior management.
- Cost, telecommunications, and corporate relations objectives are also not considered important.
- Exhibit IV-36 contains the planning issue subgroups that medical IS managers rate as their top objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the medical industry are shown in Exhibit IV-37. Thirty-four percent of the respondents said that they will be developing cross-industry applications, while the remaining 66% said they will be developing industry-specific applications.
- More information systems managers plan to develop office management applications than they do any other industry-specific application. Also being considered for 1984 are medical record management and hospital information applications. Other medical-specific applications include patient scheduling and pharmacy applications.

EXHIBIT IV-34

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
MEDICAL INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

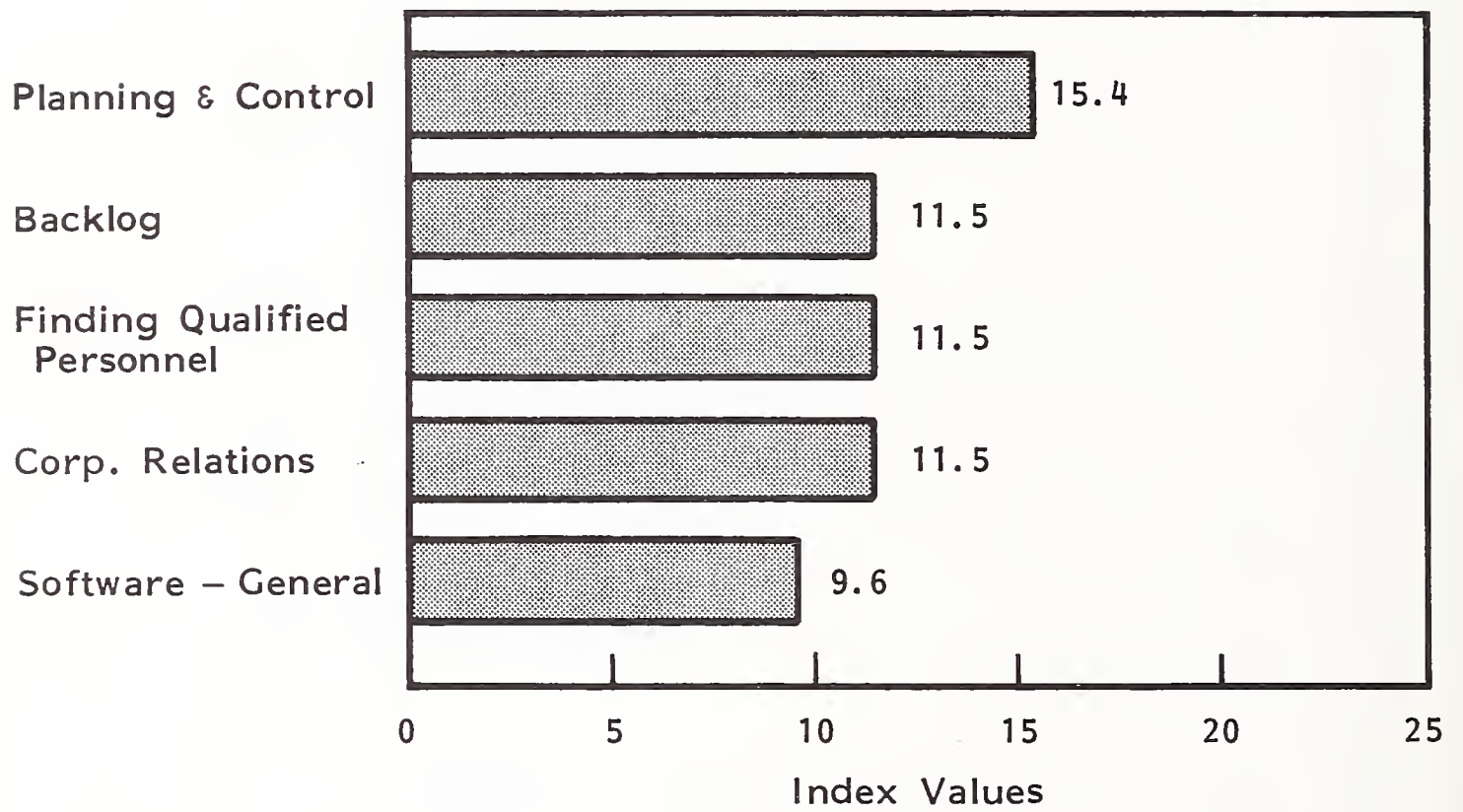


EXHIBIT IV-35

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES
IN THE MEDICAL SECTOR
(IMPORTANCE TO I.S. MANAGERS)

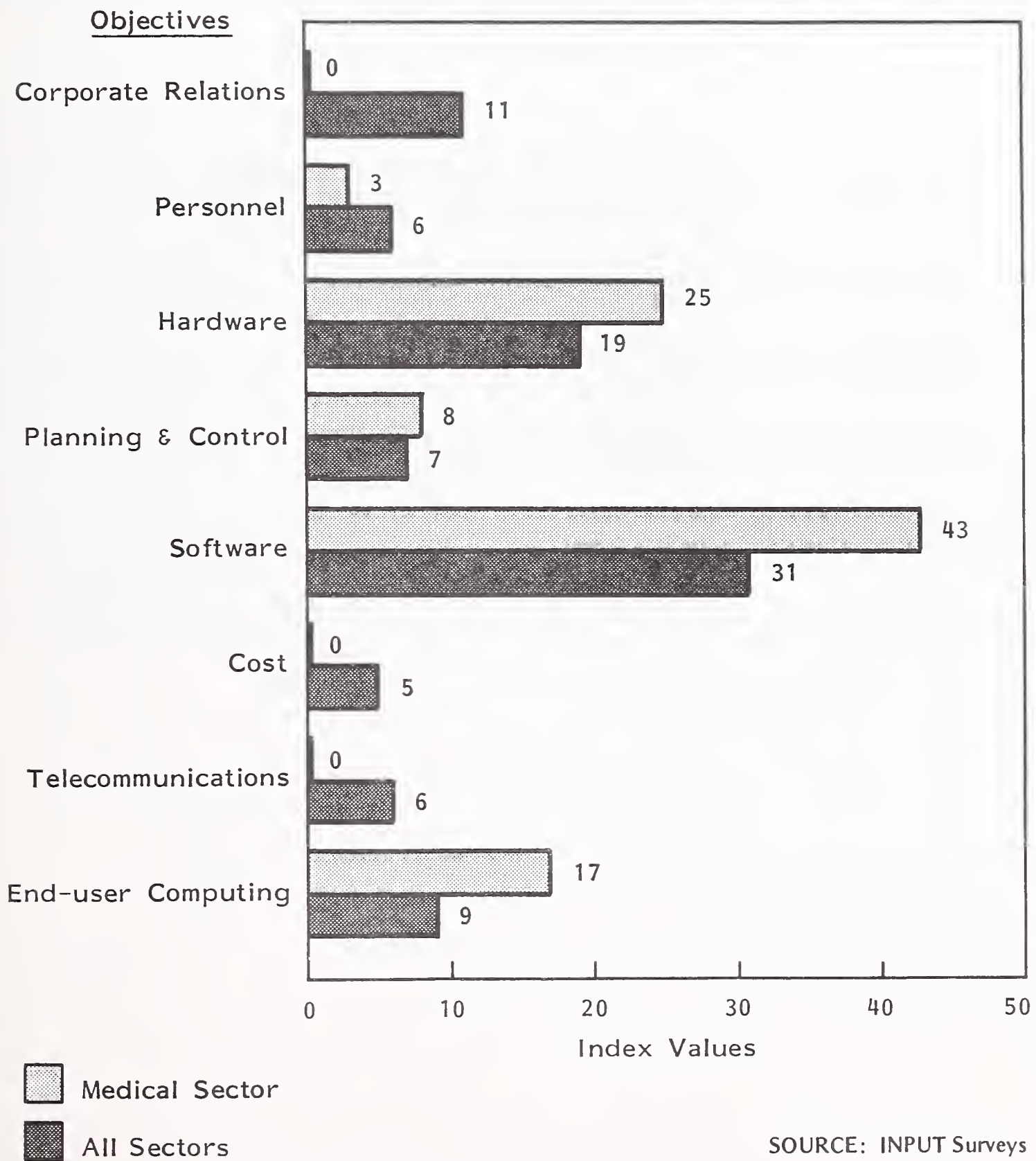


EXHIBIT IV-36

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
MEDICAL INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

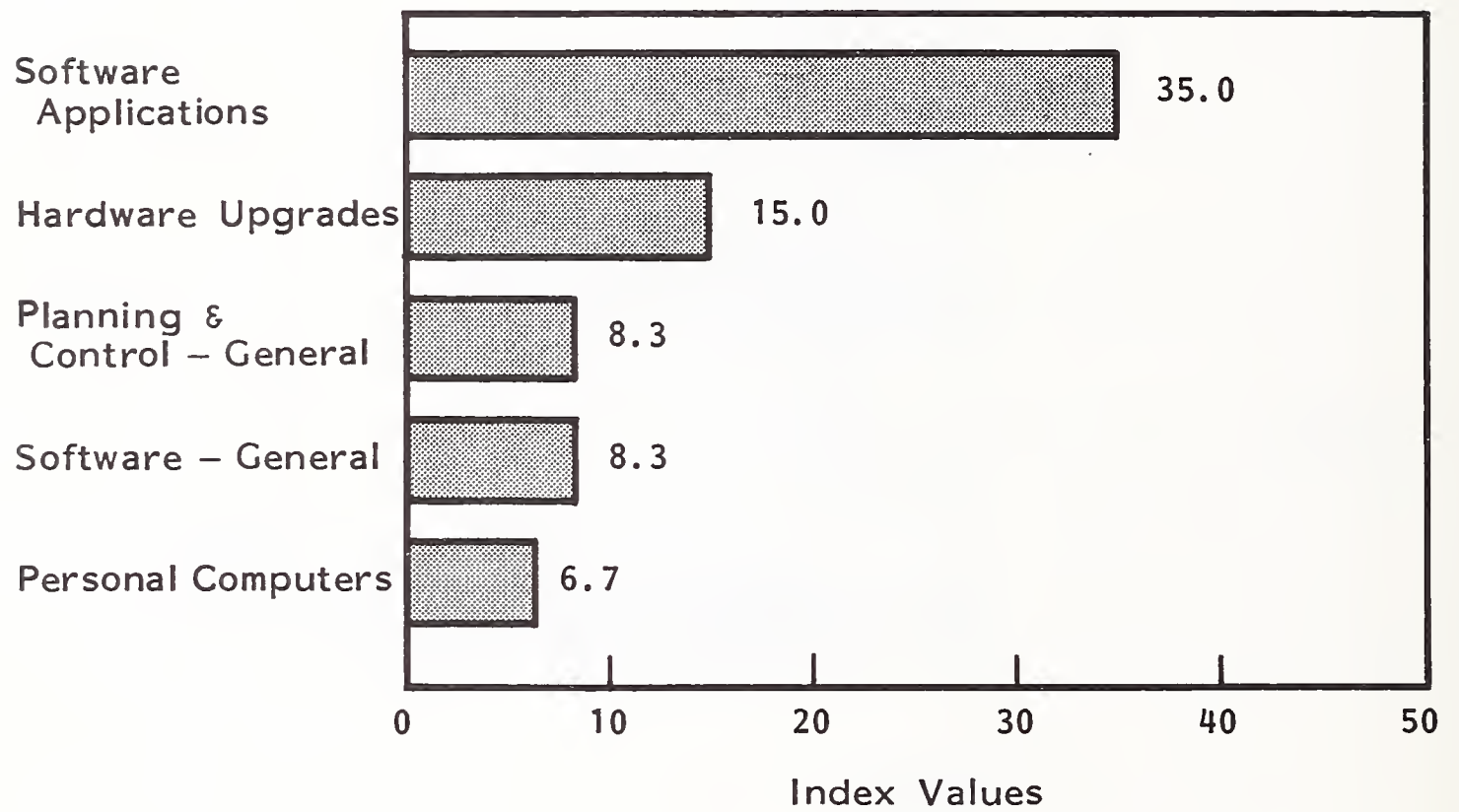
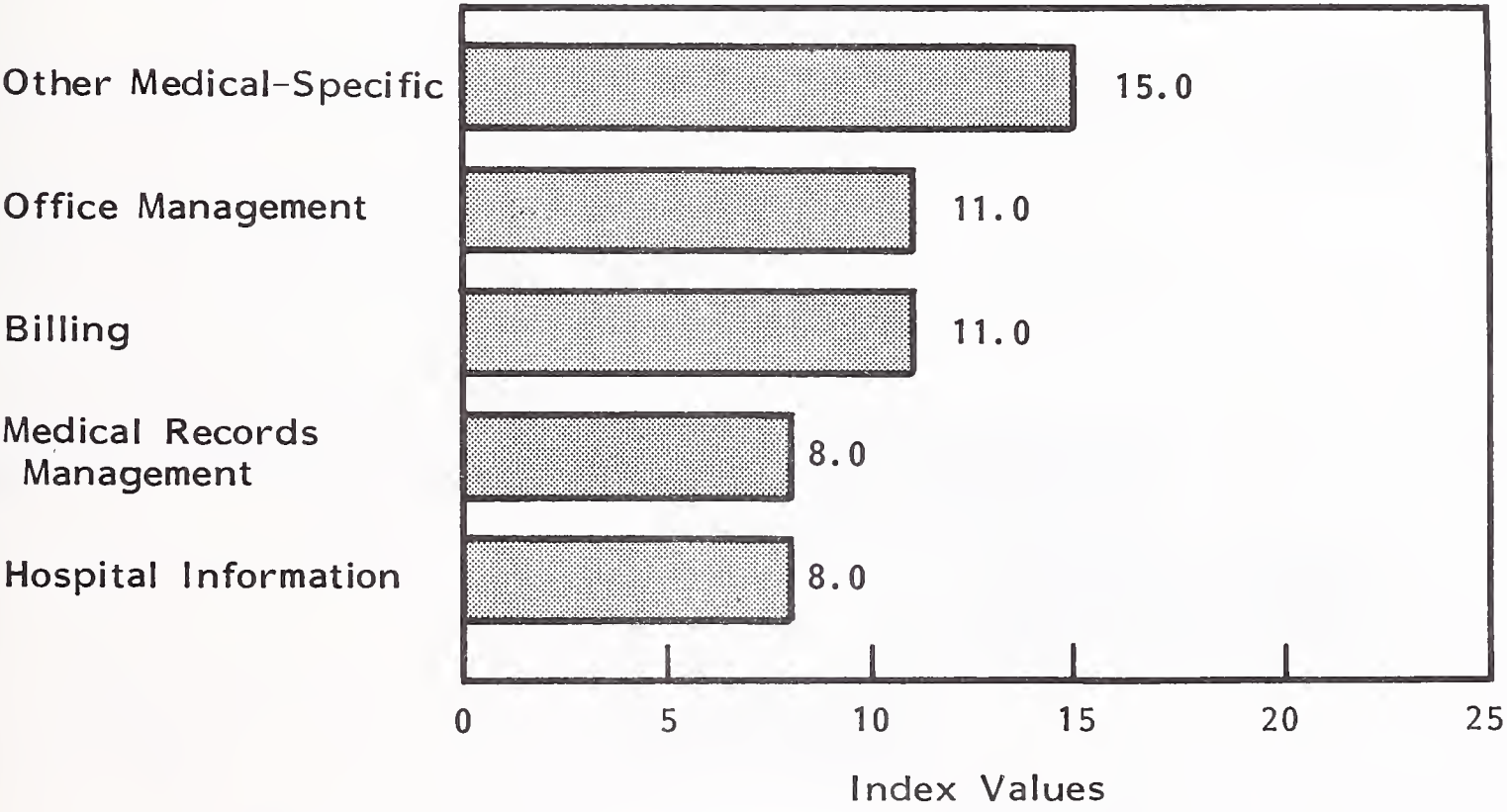


EXHIBIT IV-37

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE MEDICAL INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



- Billing applications stand out as the most popular among the cross-industry applications, but accounting applications in general are planned for next year in this industry.
- The most significant event affecting applications development within the companies interviewed was software upgrades.
- Information systems managers in the medical industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the medical industry was a change in government regulations and Medicare payment methods.

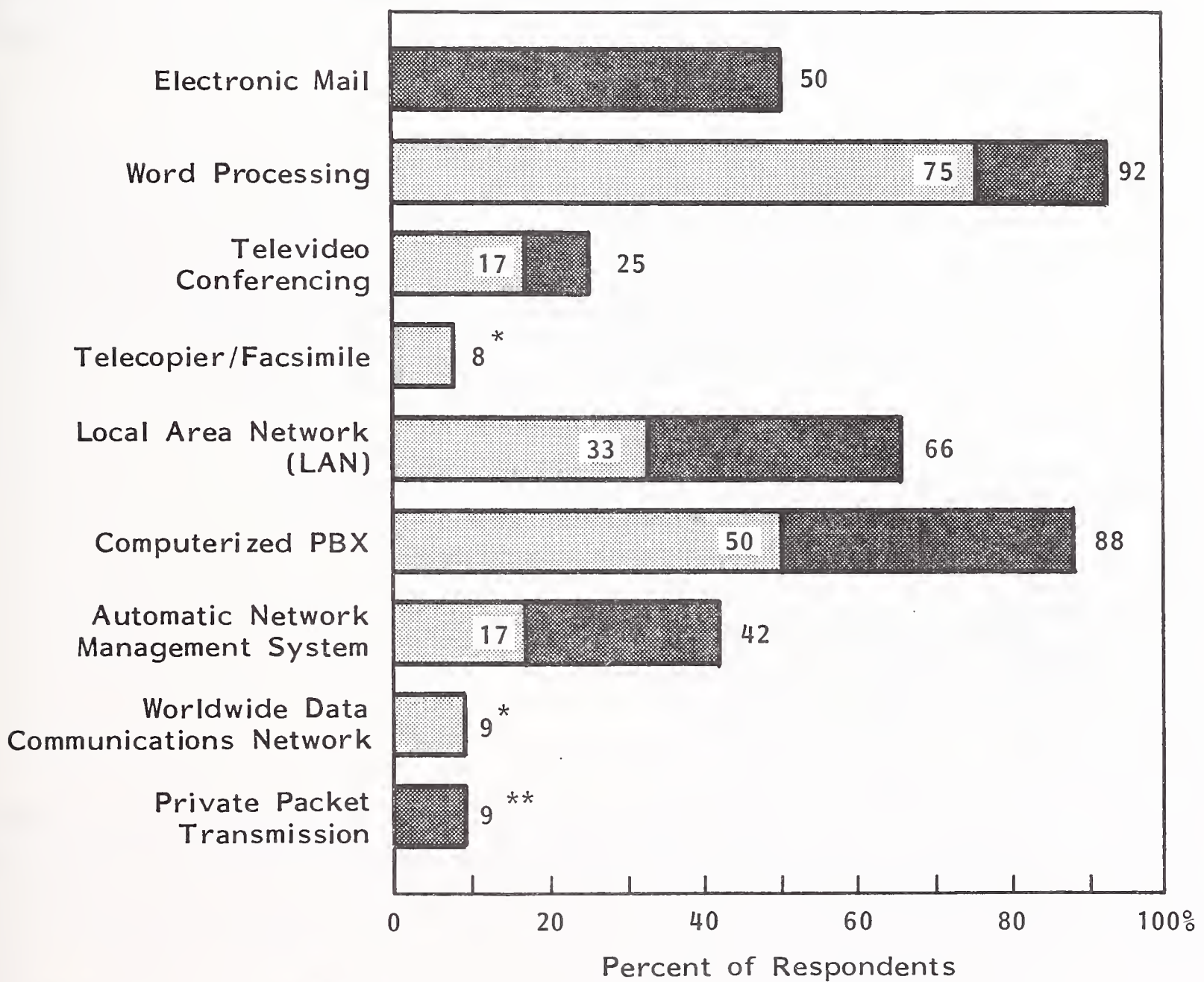
5. END-USER COMPUTING

a. Office Systems

- Electronic mail will see dramatic growth in the medical sector this year, growing from a base near zero to penetration into half our respondents' office systems by the end of 1984, as can be seen in Exhibit IV-38.
- Word processors are already pervasive in this sector, and PBXs are in use in half of our respondents' environments. LANs, used in a third, are already in greater use here than in other sectors, and, along with PBXs, will be used by another third by the end of 1984.

EXHIBIT IV-38

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE MEDICAL INDUSTRY (percent of respondents)



Using Now Expected 1984

* No Change 1984

** Now 0

- While televideo conferencing is still not widely used, it is twice as common in the medical sector as in others. Telecopier and facsimile devices are relatively rare.

b. Personal Computers

- Over nine-tenths of our respondents in the medical sector report personal computers in their organizations. On average, there are 18 PCs in each organizational entity; by 1986, there will be 64, reflecting a compound annual growth rate of 52%, as shown in Exhibit IV-39.
- Twenty-four percent of the personal computers in this sector communicate with other devices. Two-fifths of our respondents report some links with in-house computers, another two-fifths report links with other personal computers or word processors, and half have PCs that communicate with outside services, as shown in Exhibit IV-40.

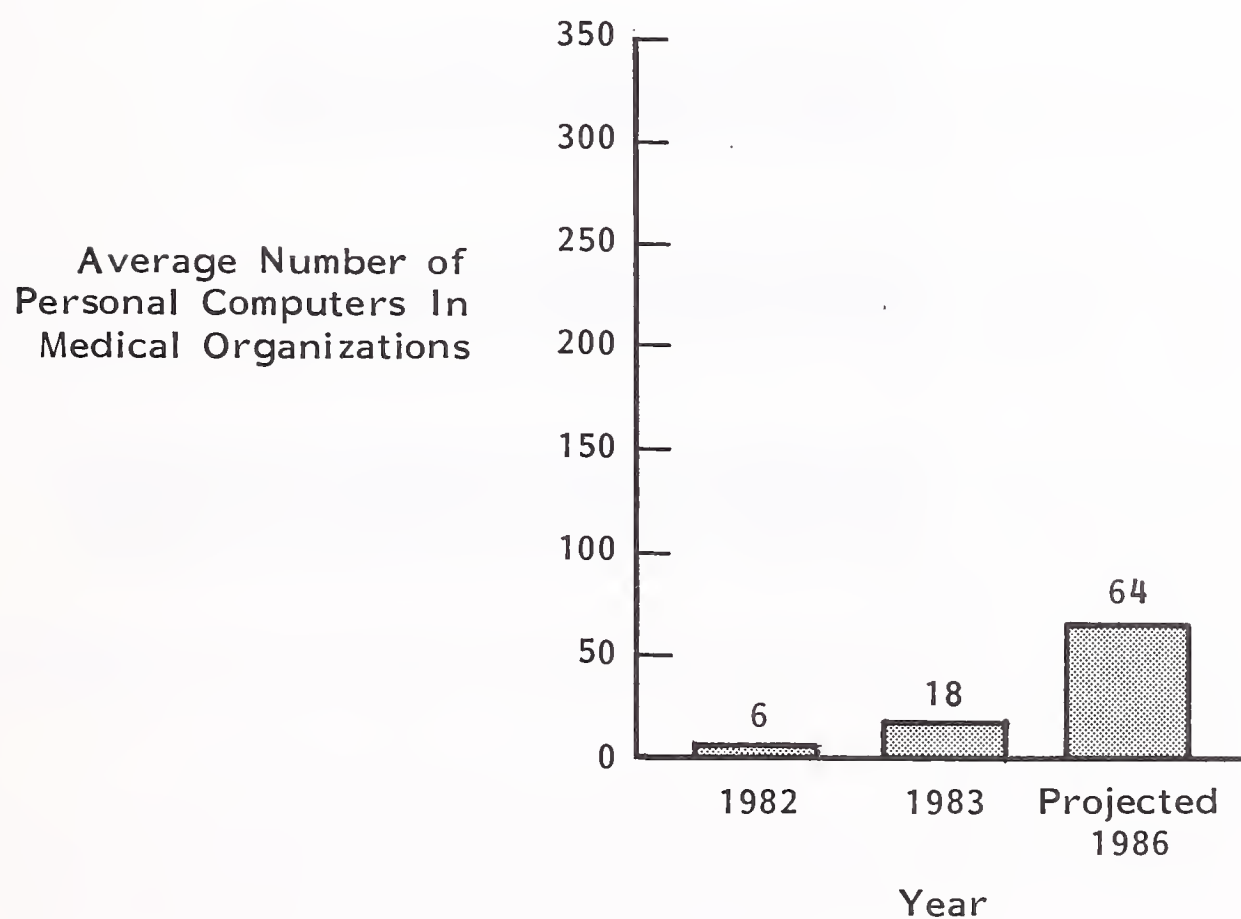
F. SERVICES SECTOR

I. INDUSTRY OVERVIEW

a. Legal Services

- Shocked by major increases in fees over the last few years, clients of large business law practices have rebelled by jumping law firms, scrutinizing bills more carefully, and creating in-house legal departments. These reactions, combined with the persisting effects of the recession, have resulted in rough times for lawyers - and these conditions will not improve much in the near future.

EXHIBIT IV-39

NUMBER OF PERSONAL COMPUTERS IN
MEDICAL SECTOR ORGANIZATIONS

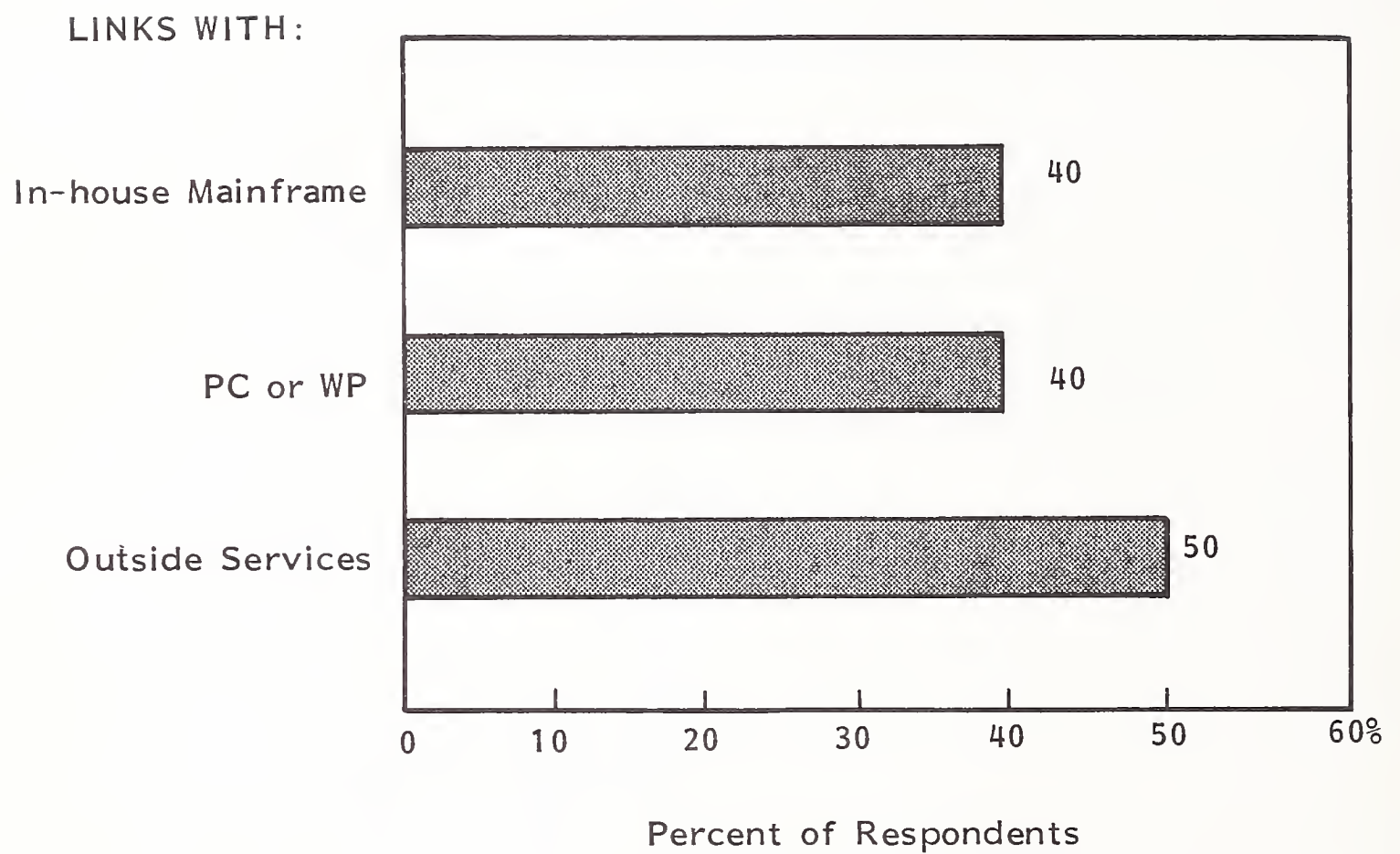
Compound annual growth rate, 1983-1986: 52%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-40

CURRENT PC COMMUNICATION
IN THE MEDICAL SECTOR



Percent of PCs linked with other systems: 24%

SOURCE: INPUT Survey

- Still, the legal profession is turning into a rapacious consumer of information services. Already using about 250,000 word processors, the increasing availability of office management and litigation assistance software and services has made leading law firms rely even more on information services. As hardware costs drop, these services are also filtering into smaller firms.

b. Accountants

- The IRS is considering allowing tax preparation firms to file taxpayers' returns electronically. It also may allow taxpayers to file returns directly from their homes electronically.
- Ten million taxpayers now have their returns prepared by computer services.
- Big Eight firms are becoming increasingly aggressive providers of information services, an extension of their "management advisory services." Their 1981 information services billings were \$495 million.

c. Engineering Services

- Engineering jobs are becoming increasingly automated. The engineering workstation is emerging as a mainstay of the engineer's tool kit.
- Following the trends in so many other industries, engineers are increasingly turning from remote computing services to in-house information processing.
- Brand-name engineering software packages for minicomputers and engineering workstations will become increasingly common, aided by mandates from government agencies that software be validated or certified by independent tests against known engineering problems.

d. Construction

- Pinched by a national downturn in commercial building activity that is caused by high interest rates and overcapacity in many industries, construction firms are delaying purchases of computer systems.

e. Hostelries

- Several hotel and motel chains are experimenting with guest room on-line computers. The terminals let guests look up airline schedules, check stock quotes and news, play simple games, and perform other tasks.
- Call accounting systems are receiving great attention from hotels and motels because the 15% commissions given by AT&T for collecting from guests ended at the beginning of 1983 (due, says AT&T, to its breakup). This has further reduced the profitability of guests' phone calls (which usually lost money even before loss of the commission).

2. BUDGET ANALYSIS

- In the services sector 94% of the companies expect information systems budgets to increase in 1984, and 6% anticipate no change.
 - The average expectation for budget growth in 1984 is 11%, significantly above the 7% growth expected for all industries.
 - This is also a significant increase above 1983's 8% growth.
- The information systems budget as a percent of total transportation company revenue is 2.3% - much higher than the .9% average for all industries.
- Exhibit IV-41 shows the distribution of expenses in services sector for information systems. This breakdown varies significantly from the average for all industries.

EXHIBIT IV-41

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE SERVICES SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	33.0%	9.6%
Mainframe Processors	6.1	9.6
Minicomputers	5.0	35.6
Micro-personal Computers	2.3	32.8
Terminals	3.9	7.2
Peripherals	4.0	6.4
Total Hardware	21.3%	14.3%
Communications	4.6	13.0
External Software	1.9	2.5
Custom Programming	0.5	5.4
Integrated Systems	0.1	0.0
Total Software	2.5%	2.5%
Software Maintenance	1.4	16.4
Hardware Maintenance	4.3	4.3
Total Maintenance	5.7%	7.2%
Outside Processing Services	19.2	9.9%
Other	13.6	4.4
Total	100.0%	11.0%

- Spending on outside processing services is extremely high, almost surpassing total hardware expenditures.
- Software spending is quite low, a reflection of the dominance of processing services.
- The biggest increases in spending in 1984 will be on mini and microcomputers.
 - Software maintenance and communications expenditures will also increase substantially.
 - External software spending will remain relatively flat.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- While senior executives in the services sector rate cost as their top concern, they rate hardware and corporate relations almost as high, as can be seen in Exhibit IV-42.
- Planning and control, corporate relations, and personnel are also relatively strong concerns.

b. Problems

- Senior information systems managers in the services sector rate personnel and corporate relations problems highest, as shown in Exhibit IV-43. Hardware is also rated a significant concern - in particular, hardware reliability. Meeting the need for qualified personnel is the primary personnel concern.

EXHIBIT IV-42

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS
IN THE SERVICES SECTOR

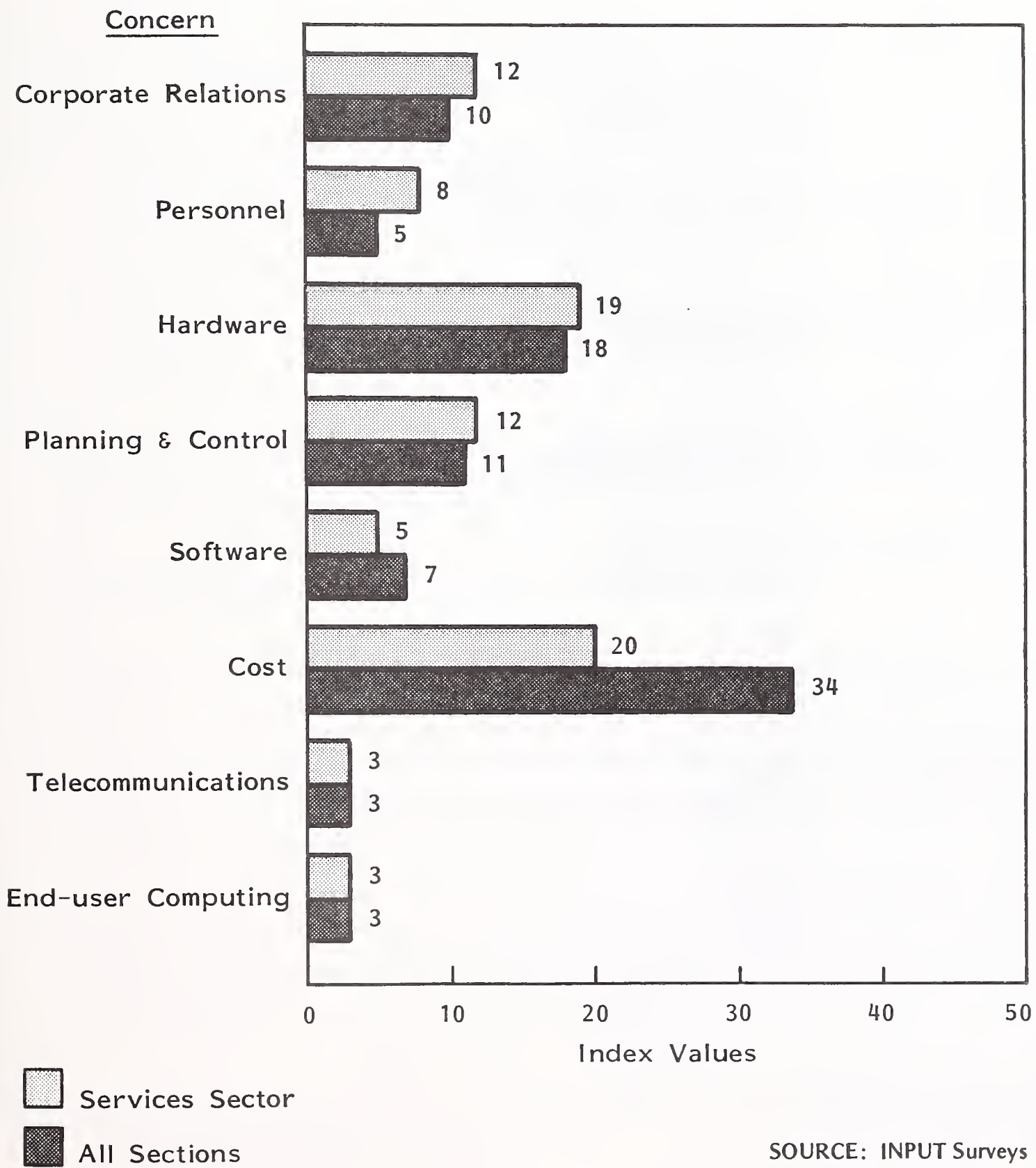
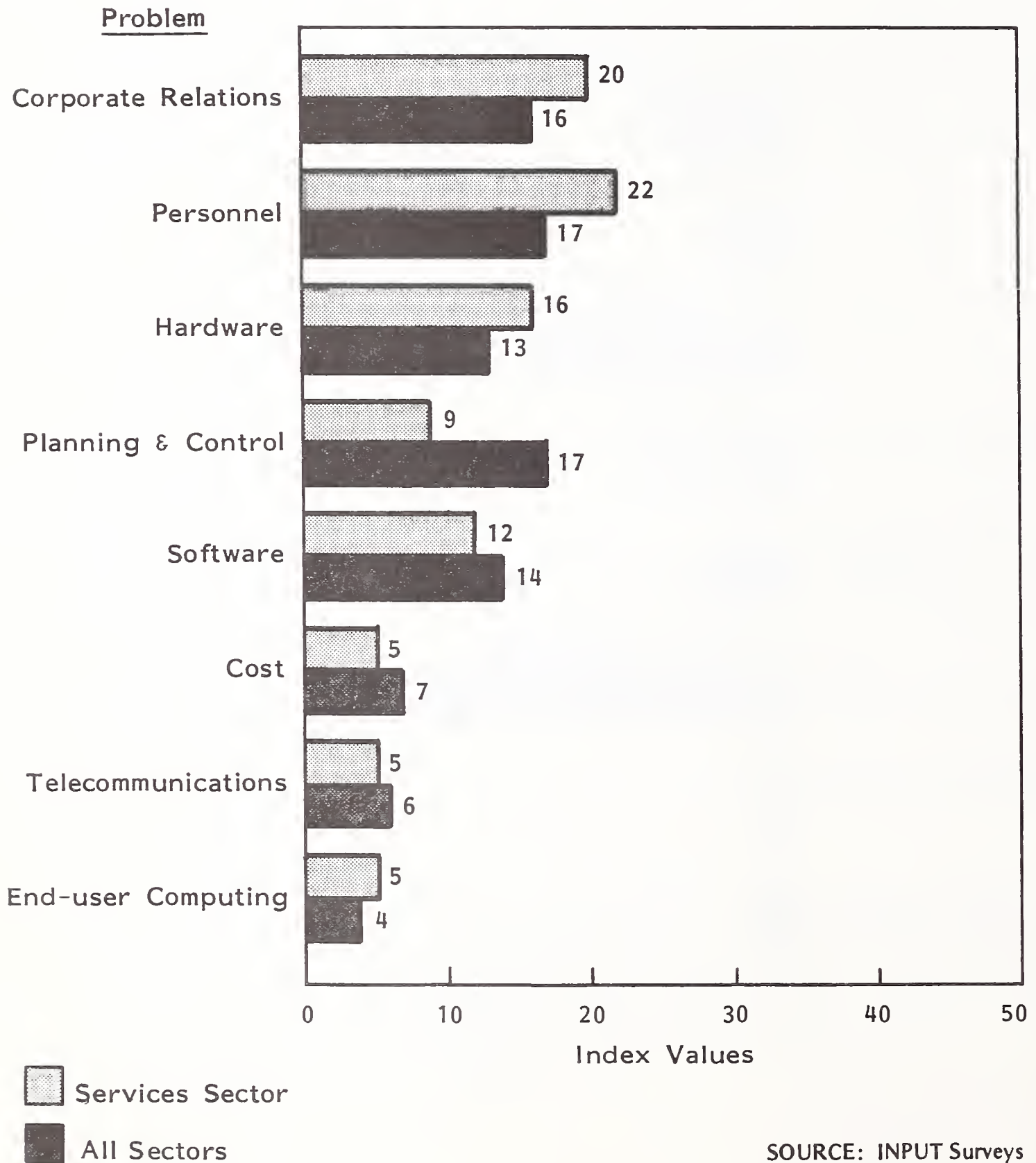


EXHIBIT IV-43

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE SERVICES SECTOR
(IMPORTANCE TO I.S. MANAGERS)



- On the other hand, planning and control, and software concerns rate relatively low, as does cost - in marked contrast to the concerns of senior corporate executives.
- Exhibit IV-44 shows the planning issue subgroups that were rated as top problems by the service IS managers.

c. Objectives

- The services sector ranks objectives in a manner that is relatively close to the industry norm, with software objectives at the top, as shown in Exhibit IV-45. Corporate relations, personnel, and cost objectives are rated higher than the industry norms. Software applications objectives are the principal component of the software category, and hardware upgrade objectives are also ranked high.
- Exhibit IV-46 contains the planning issue subgroup that IS managers in the service sector rated as their top objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the services industry are shown in Exhibit IV-47. Forty-two percent of the respondents said that they will be developing cross-industry applications, while the remaining fifty-eight percent said they will be developing industry-specific applications.
- Retail banking and electronic fund transfer applications are anticipated during 1984 by information systems managers in the services industries. Most of these respondents are in computer services.
- Many information systems managers expect to develop general ledger and order entry applications in the next year.

EXHIBIT IV-44

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
SERVICES INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

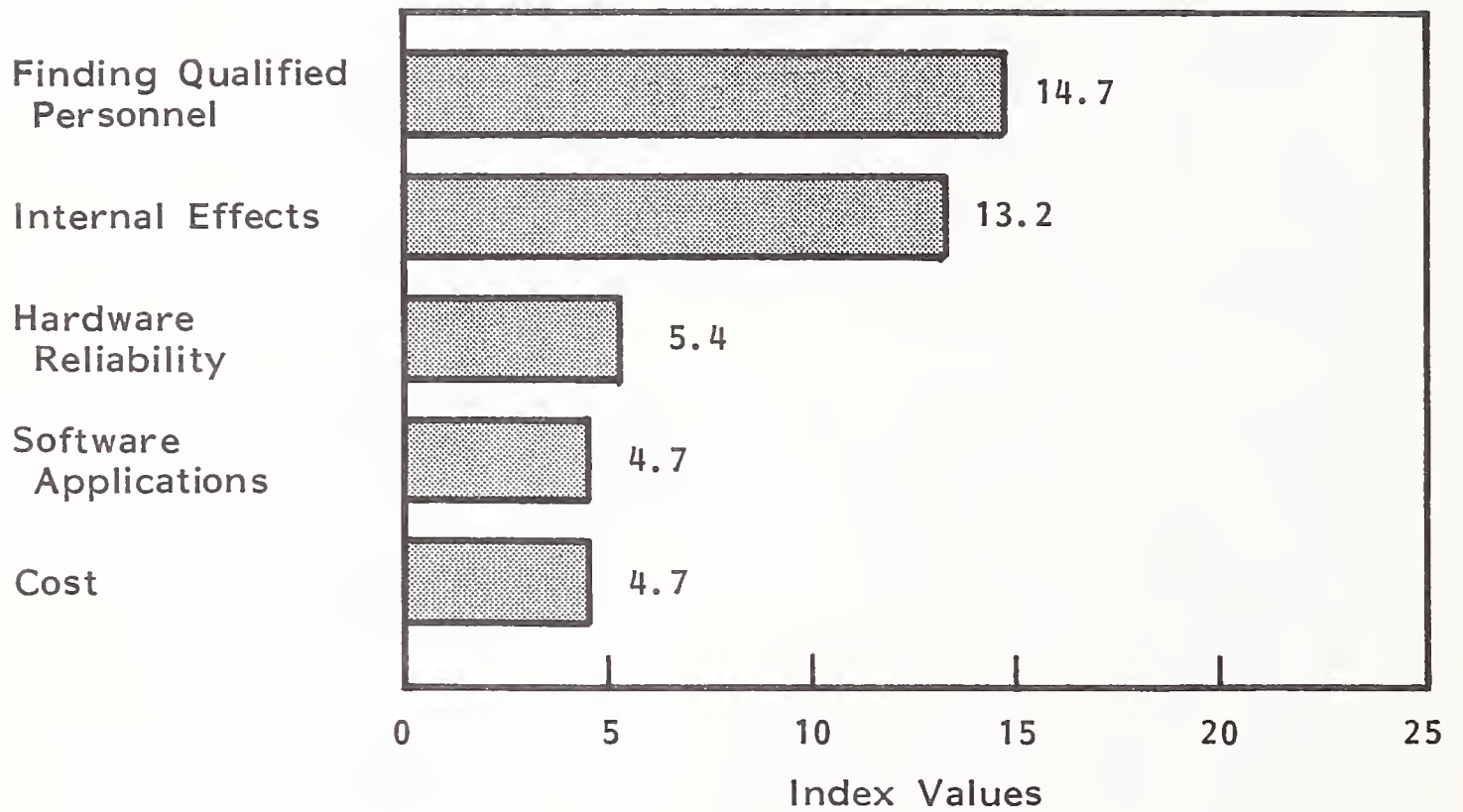


EXHIBIT IV-45

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES IN THE SERVICES SECTOR (IMPORTANCE TO I.S. MANAGERS)

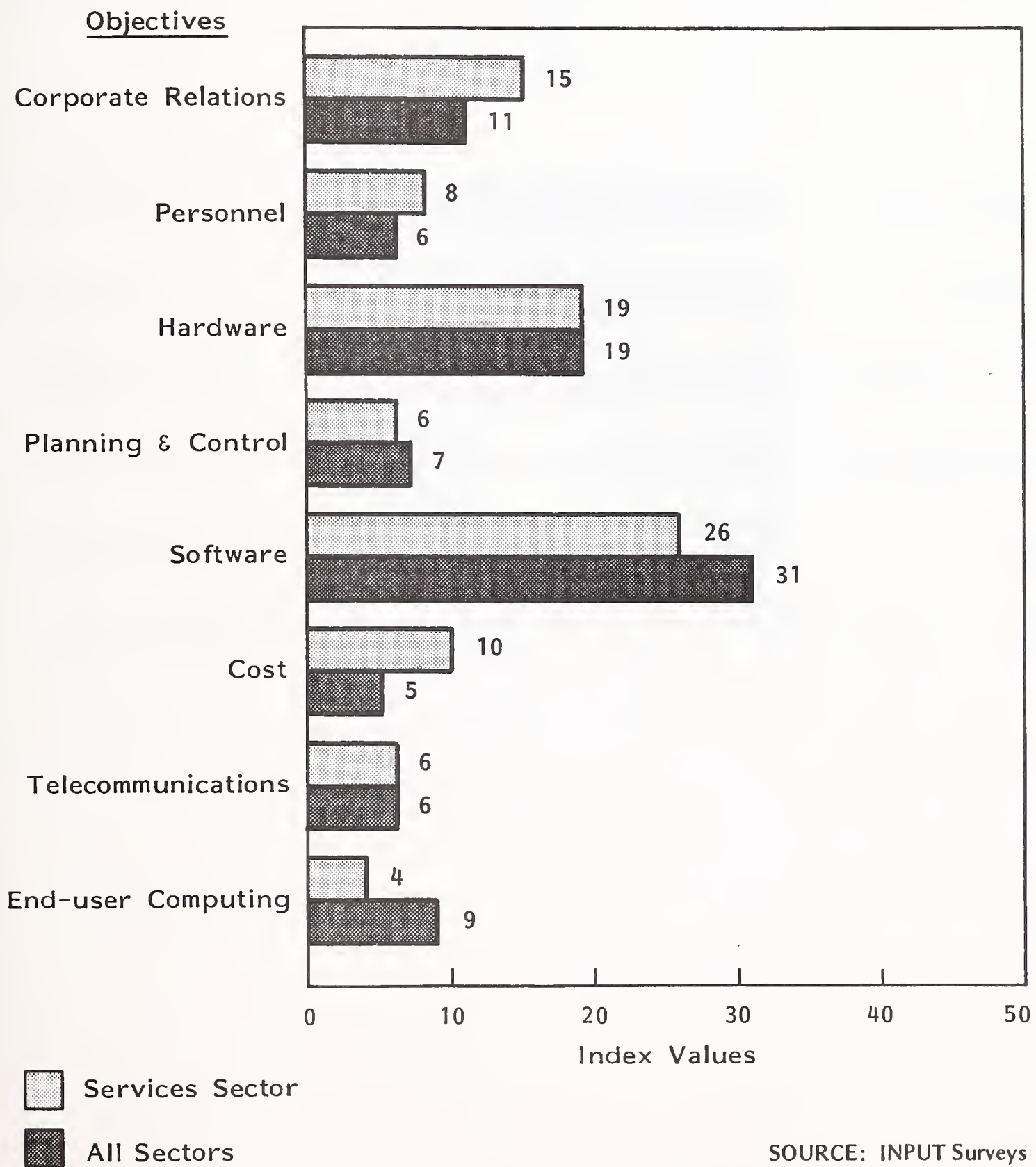


EXHIBIT IV-46

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
SERVICES INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

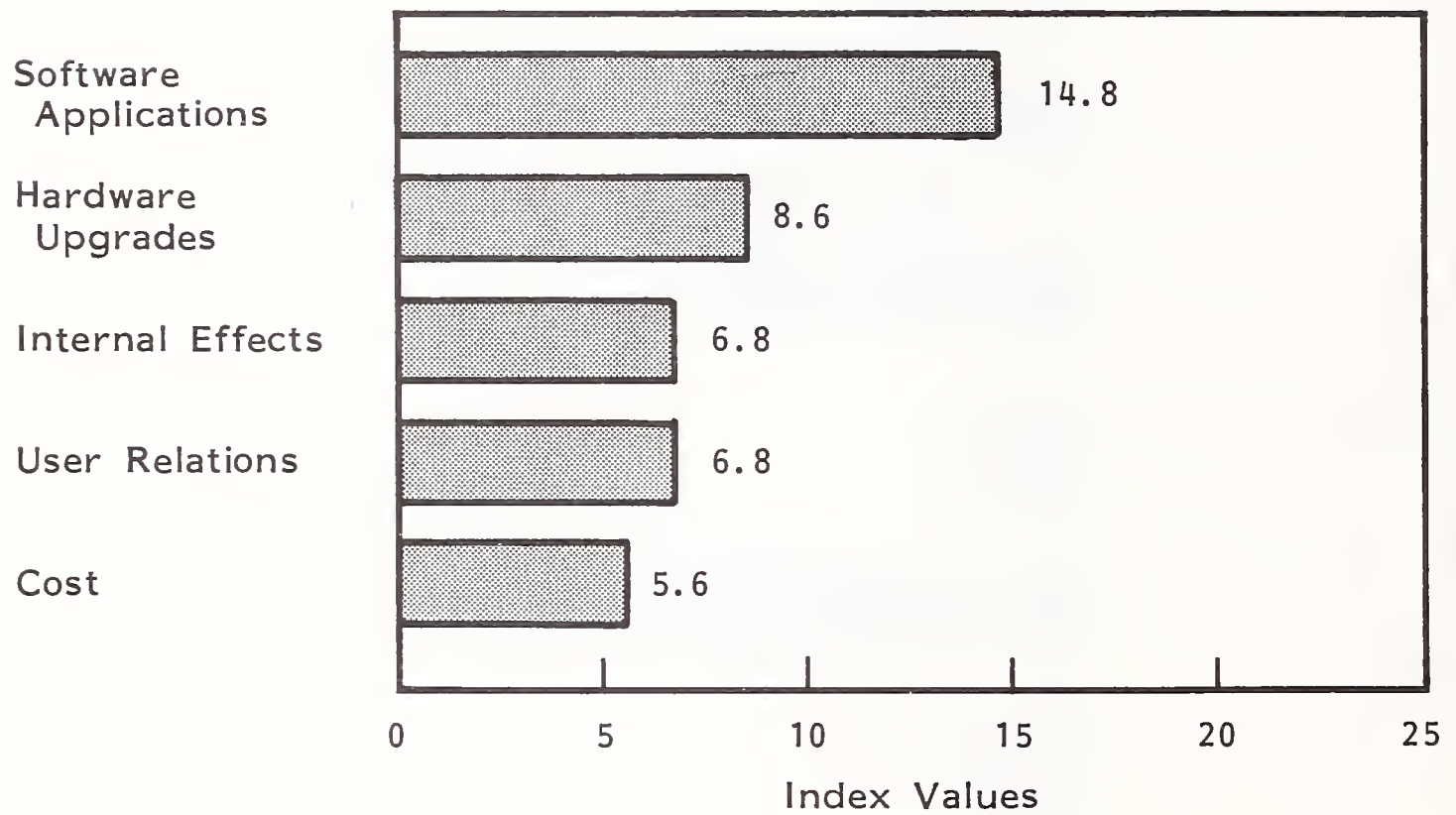
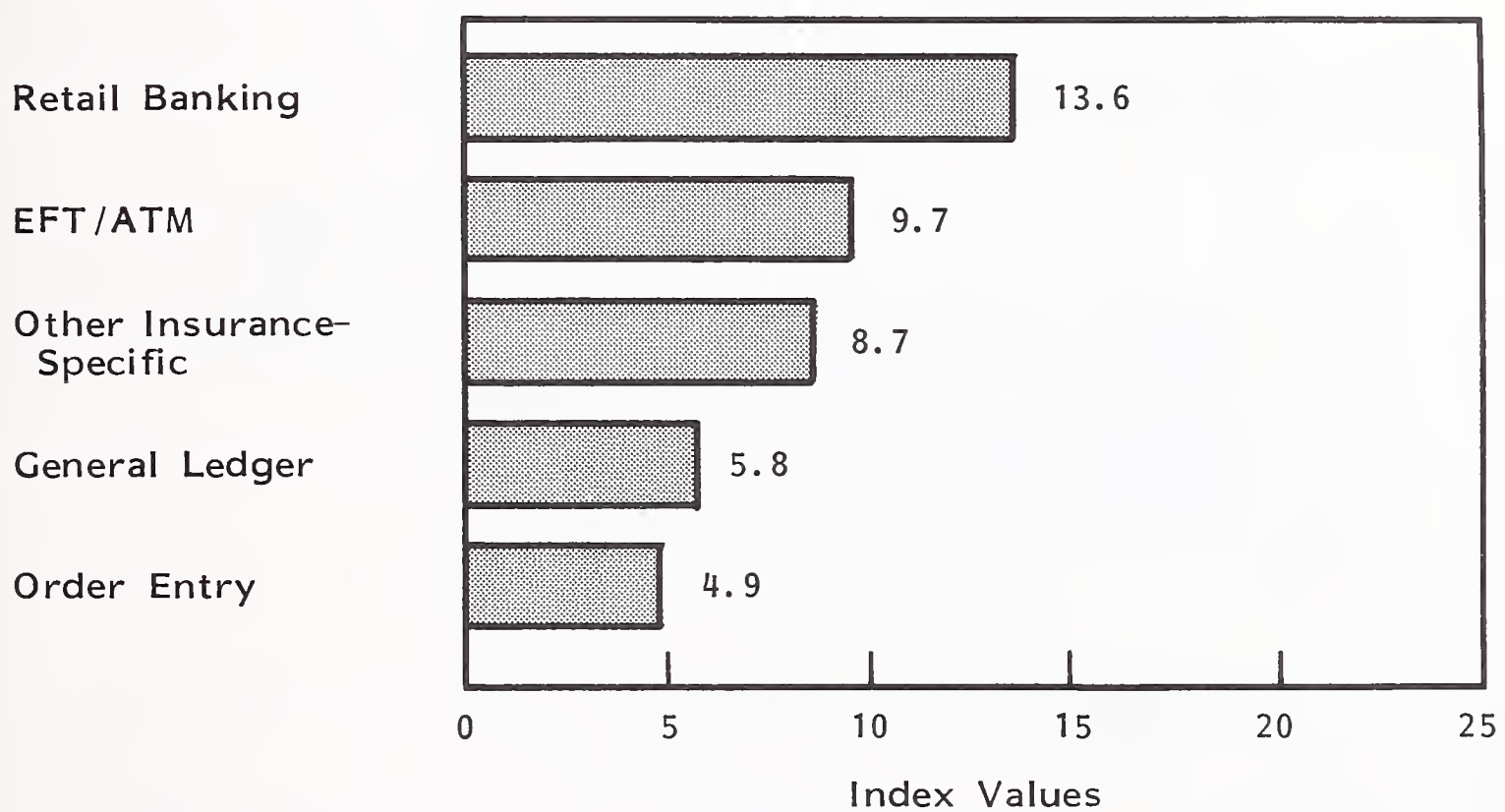


EXHIBIT IV-47

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE SERVICES INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



- The most significant events affecting applications development within the companies interviewed were software upgrades and changes in government regulations.
- Information systems managers in the services industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the services industry was the invention of new software applications. The recession and new government regulations also affected applications development in the services industry.

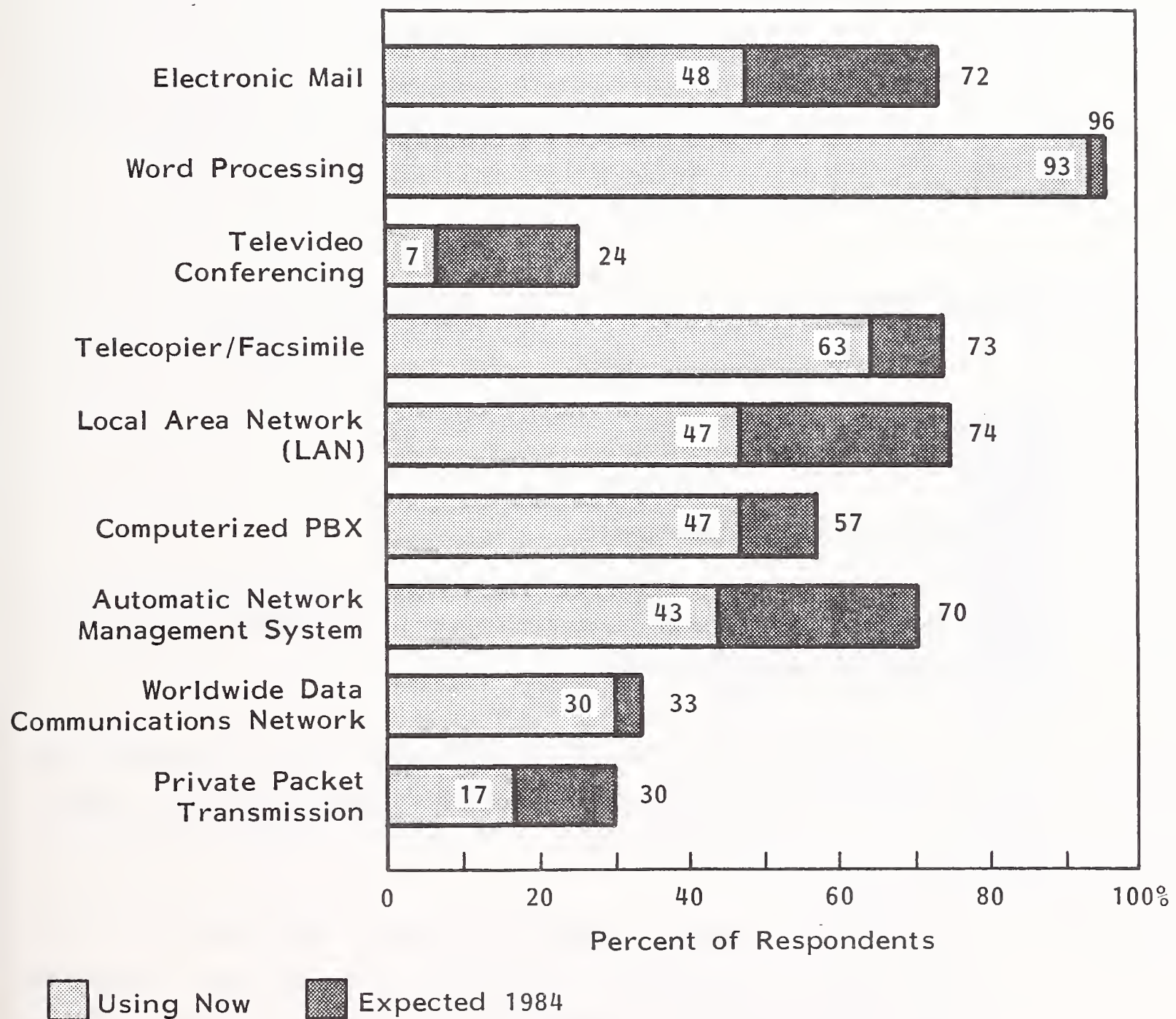
5. END-USER COMPUTING

a. Office Systems

- Local-area networks, electronic mail, and Automatic Network Management Systems are the fastest growing office systems applications in the services sector, with a quarter of our respondents reporting their intentions to implement both by the end of 1984, as can be seen in Exhibit IV-48.
- But word processors are the most pervasive office systems applications in this sector. Telecopiers and facsimile devices, and PBXs are also relatively common, being used by almost half of our respondents.
- Televideo conferencing is only seldomly utilized by this sector.

EXHIBIT IV-48

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE SERVICES INDUSTRY



b. Personal Computers

- Over nine-tenths of our respondents in the services sector report personal computers in their organizations. On average, there are 38 PCs in each organizational entity; by 1986, there will be 163, reflecting a compound annual growth rate of 63%, as shown in Exhibit IV-49.
- About 9% of the personal computers in this sector communicate with other devices. Over two-fifths of our respondents report some links with in-house computers, two-tenths report links with other personal computers or word processors, and over a tenth have PCs communicating with outside services, as shown in Exhibit IV-50.

G. UTILITIES SECTOR

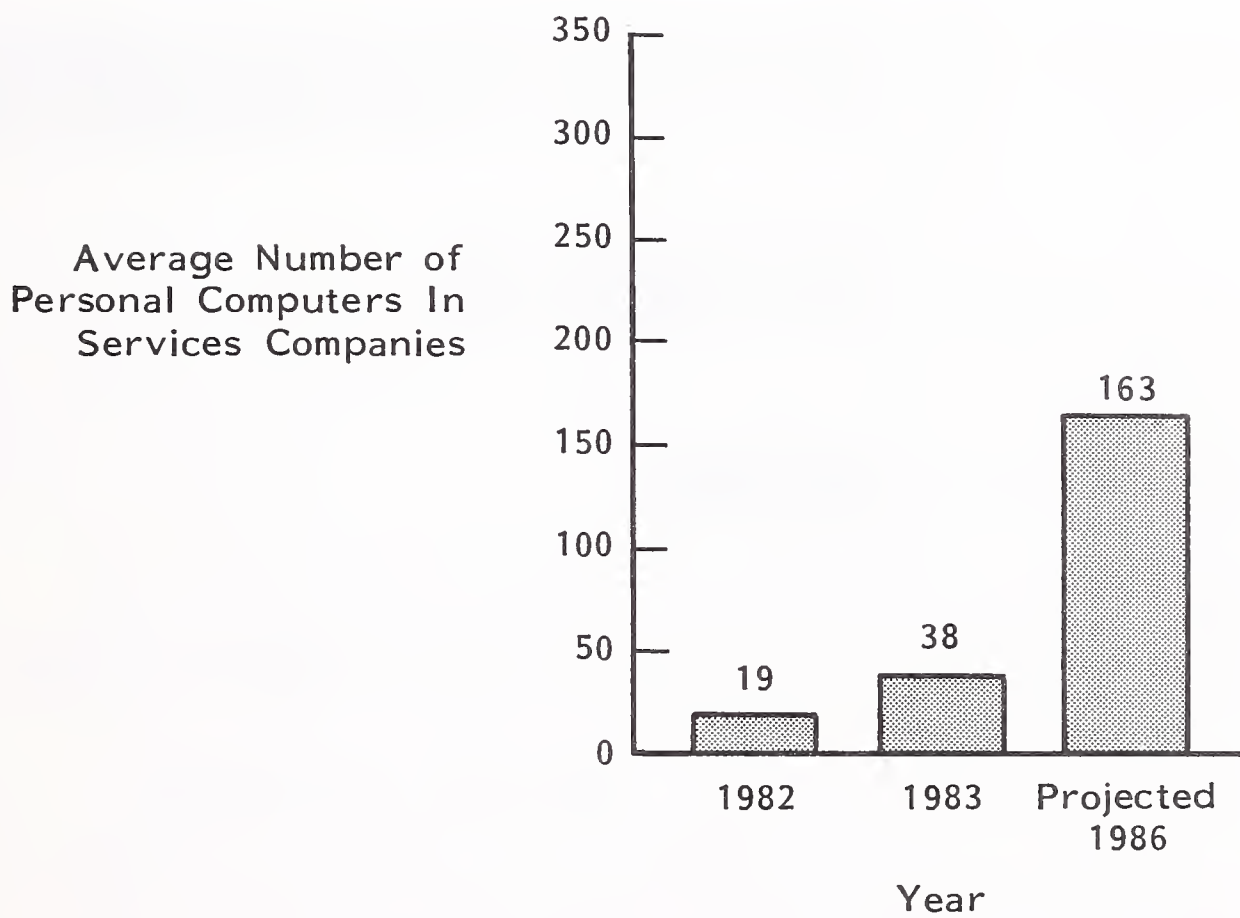
I. INDUSTRY OVERVIEW

a. Telecommunications Segment

- The telecommunications industry is undergoing an unprecedented period of structural and technological change.
- On January 1, 1984, the Bell Operating Companies (BOC) will be split from American Telephone and Telegraph (AT&T) and formed into seven regional companies.
 - Rates for local residence phones will double by 1985, partly as a result of the loss of long-distance subsidization revenue from AT&T and partly for other economic reasons. The new regional companies will be financially weaker than before the divestiture.

EXHIBIT IV-49

NUMBER OF PERSONAL COMPUTERS IN
SERVICES SECTOR COMPANIES



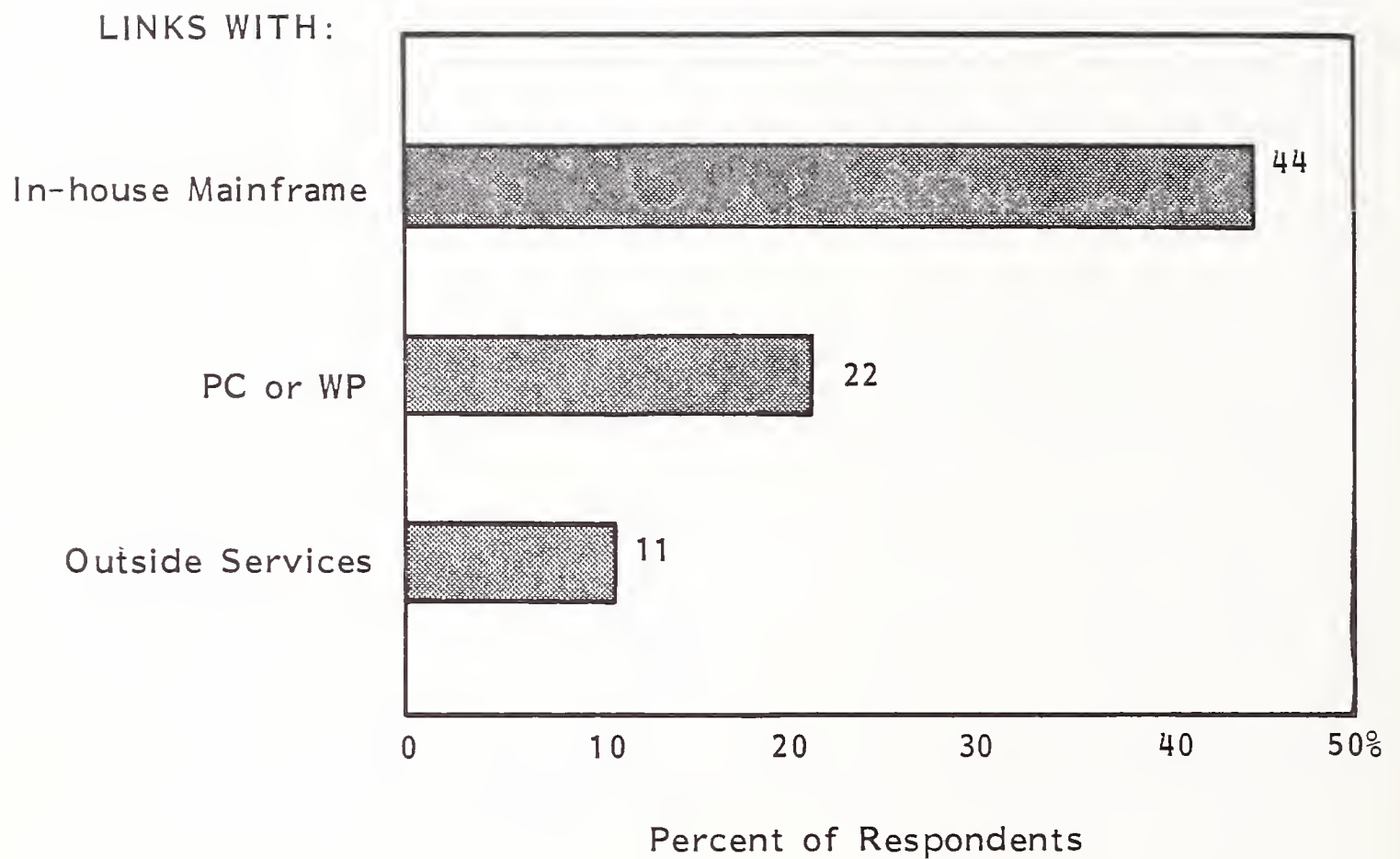
Compound annual growth rate, 1983-1986: 63%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-50

CURRENT PC COMMUNICATION
IN THE SERVICES SECTOR



Percent of PCs linked with other systems: 9%

SOURCE: INPUT Survey

- The new regional companies have already signalled their intention to shop more widely for equipment and services after the divestiture. Before, all equipment had to be approved by AT&T.
- But, on the other side of the coin, AT&T itself is now free to compete aggressively outside the Bell System.
- Cellular radio will begin service in some cities in 1984. It will be a \$4 billion industry by 1990.
- In another technological development, the increasing demand for data communications services and the improved economics of providing these services will cause continued growth (about 15% a year) in the data communications portion of the U.S. telecommunications marketplace.
- In the television broadcasting sector, the traditional television broadcasting networks are doing well but face increased competition from newer program delivery vehicles.
 - Even though almost all cable television networks are losing money and don't expect profits for another year or two, new entrants continue to start. There were 20 cable networks at the end of 1982. After an expected industry shake-out, probably five will be left.
 - The Federal Communications Commission granted permission to Satellite Television Corporation in September, 1982, to build a direct broadcasting satellite (DBS). This and other services already in existence (multipoint distribution service, subscription television, and satellite master antenna television) should ultimately claim 10% of the existing cable subscriber universe.
 - Two-way transmission via cable is being pushed by cable operators and may gain FCC approval.

b. Electrical/Gas Sector

- No new orders for major American nuclear or fossil-fueled plants have been placed since 1981. Utilities are focusing instead on using existing plants more intensively. In particular, they are trying to increase efficiency, availability, and reliability.
- Behind this trend are forecasted declines in electrical demand of 2% or 3% a year and increasing peak demand reserve capacity from plants that were conceived when demand was thought to be insatiable and are now coming on line.
- These new plants typically generate power that is more expensive than older plants, necessitating rate increases. But state regulatory agencies are reluctant to grant these increases because they believe overcapacity should have been foreseen and new plants not built.
- Gas utilities are suffering from substantially diminished demand due to warm weather and strong competition from fuel oil.
- Restraints on electricity production capacity and conservation efforts have made load flow, distribution, and other electrical systems and energy management applications the items of greatest concern to utilities information services vendors.

2. BUDGET ANALYSIS

- In the utilities sector 79% of the companies expect information systems budgets to increase in 1984 and 16% of the companies expect no change. Five percent expect decreases.

- The average expectation for growth is 12%, which is significantly above the 7% average for all industries, and considerably larger than 1983's 8% growth.
- The information systems budget as a percent of total utility revenue is 0.9% - the same as the average for all industries.
- Exhibit IV-51 shows the distribution of expenses in utility information systems budgets. This breakdown closely parallels the average for all industries.
 - Spending on mainframes dominates all other budget items.
 - Software maintenance expenses are unusually high.
 - Outside processing services expenses are only a third of the average for all industries.
- The largest percentage increase in spending in 1984 will be on microcomputers.
 - The highest - and dominant - increase in budget growth rate will be related to mainframes.
 - Spending on terminals, custom programming, and integrated systems will decrease.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- While utilities industry executives do not place as high a value on cost as do other industry managers, they place an especially high premium on corporate relations and software concerns. Hardware, and planning and control issues are also rated important, as can be seen in Exhibit IV-52.

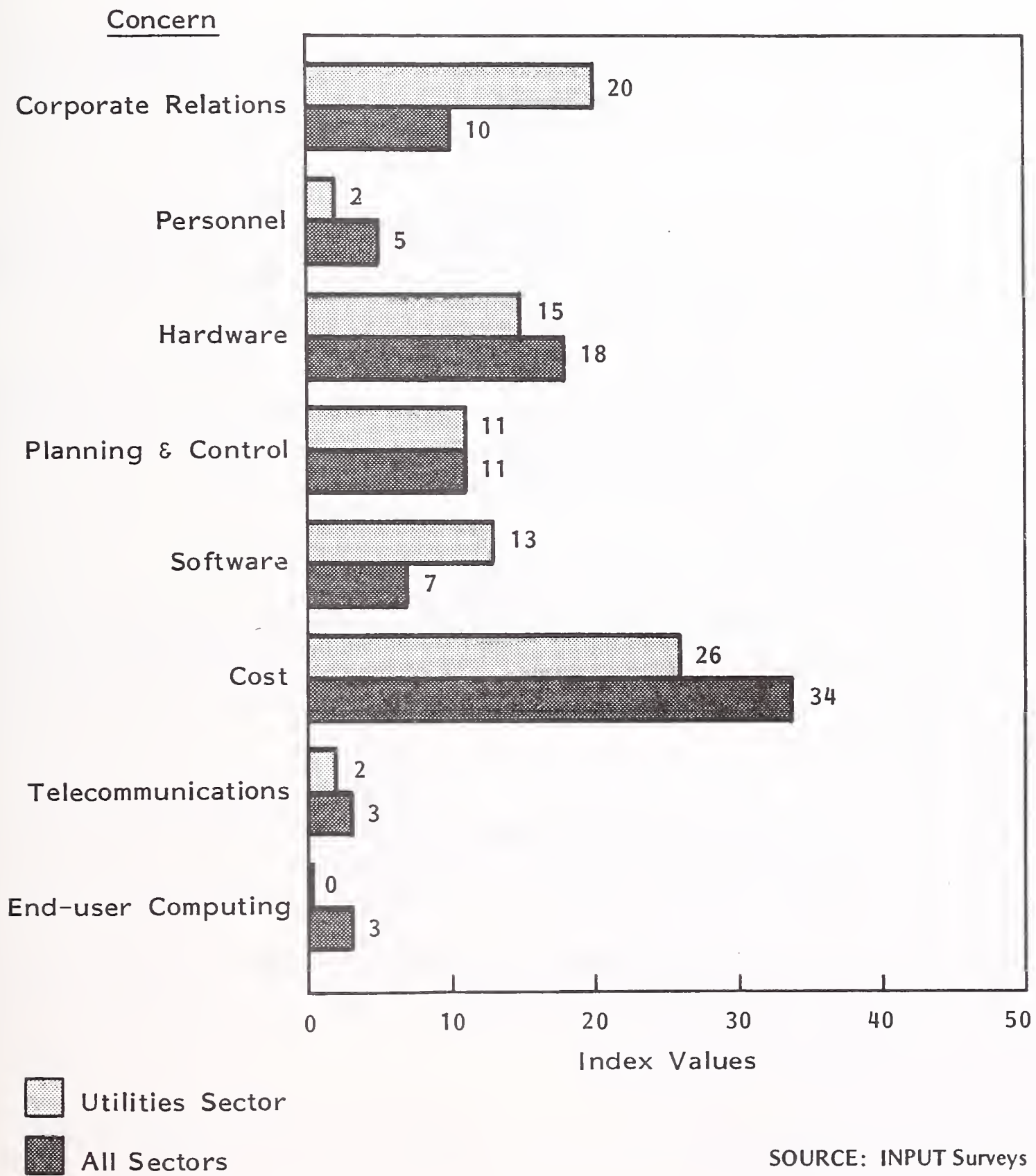
EXHIBIT IV-51

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE UTILITIES SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	43.8%	6.7%
Mainframe Processors	11.9	17.5
Minicomputers	2.9	3.3
Micro-personal Computers	2.0	22.3
Terminals	5.9	(8.0)
Peripherals	5.7	6.4
Total Hardware	28.4%	12.2%
Communications	7.3	8.7
External Software	3.0	1.4
Custom Programming	1.6	(3.9)
Integrated Systems	0.6	(15.5)
Total Software	5.1%	(1.5%)
Software Maintenance	3.1	6.0
Hardware Maintenance	3.8	7.6
Total Maintenance	6.9%	6.9%
Outside Processing Services	1.2	6.1
Other	7.3	(2.9)
Total	100.0%	11.9%

EXHIBIT IV-52

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS
IN THE UTILITIES SECTOR



- Personnel issues cause relatively little concern, a reflection of the low turnover this industry enjoys as a result of its inherent geographic dispersion (i.e., IS departments that are outside of major metropolitan areas).

b. Problems

- Utilities information systems managers are most concerned with hardware, rating it higher than any other sector, as shown in Exhibit IV-53. Personnel, and planning and control issues also loom as major concerns.
- On the other hand, corporate relations and software problems cause relatively little concern among information systems managers - in stark contrast to the importance attached to both by senior corporate executives.
- Exhibit IV-54 contains the planning issue subgroups that were rated by utility IS managers as their top problems.

c. Objectives

- Utilities information systems managers rate software objectives highest, following the general industry pattern, as shown in Exhibits IV-55 and IV-56. Hardware objectives are the next most important, again mimicking most other industries.
 - As in many other segments, software applications and hardware upgrade objectives rate particularly high.
 - The importance attached to software objectives is in marked contrast with the relatively low importance attached to software problems (Exhibit IV-53).
 - User relations objectives are also attracting great attention.

EXHIBIT IV-53

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE UTILITIES SECTOR
(IMPORTANCE TO I.S. MANAGERS)

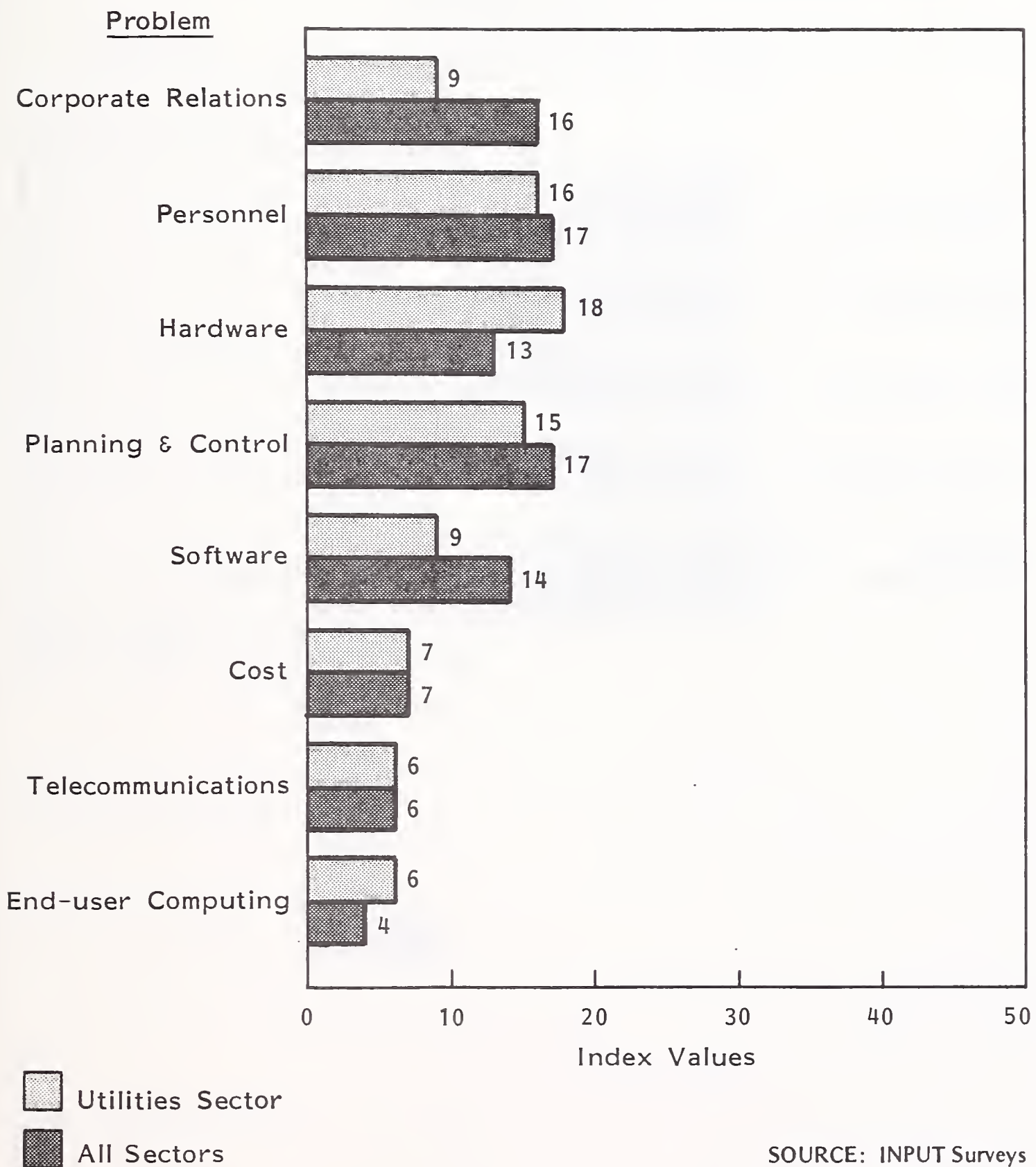


EXHIBIT IV-54

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
UTILITIES INDUSTRY

(IMPORTANCE TO I.S. MANAGERS)

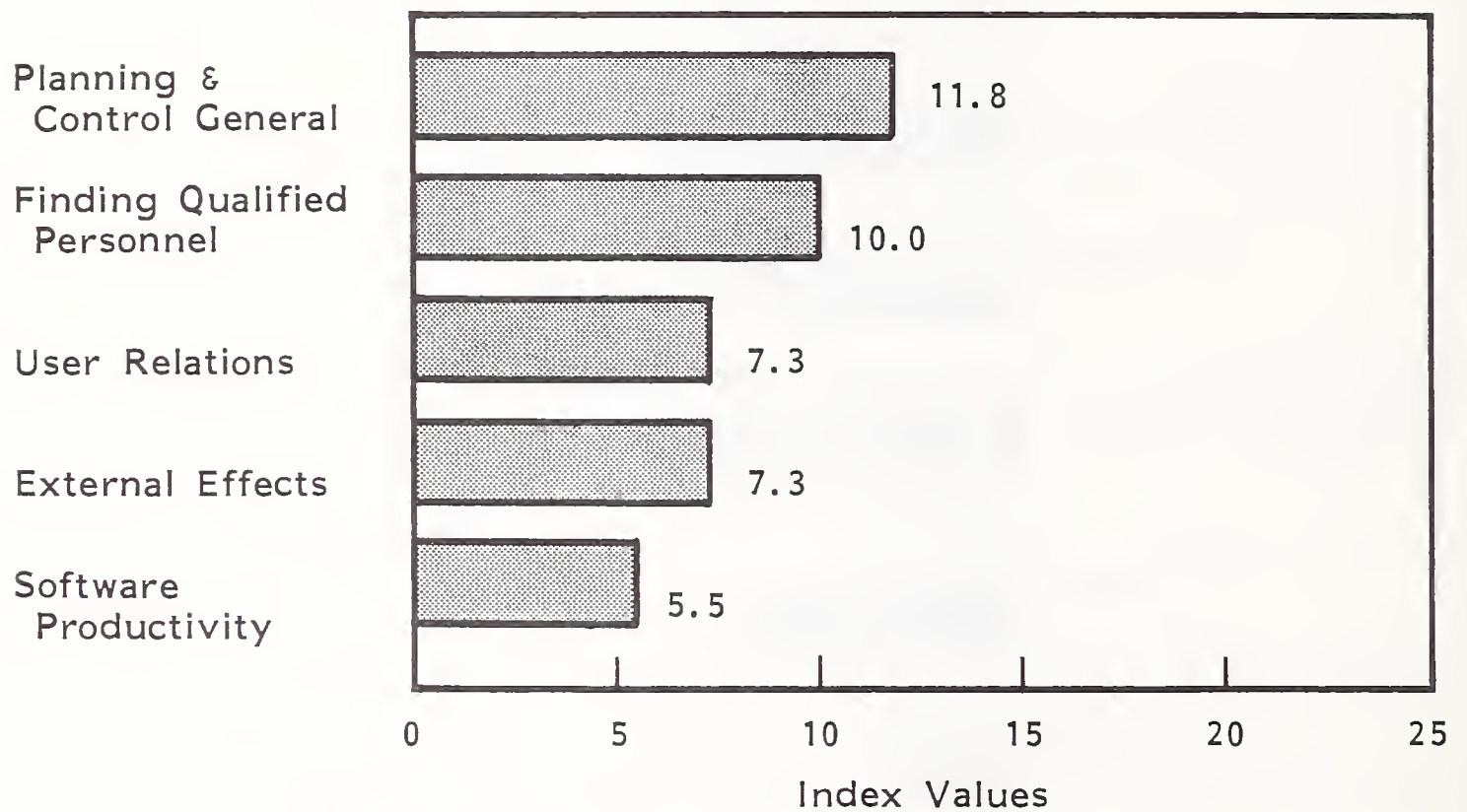


EXHIBIT IV-55

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES IN THE UTILITIES SECTOR (IMPORTANCE TO I.S. MANAGERS)

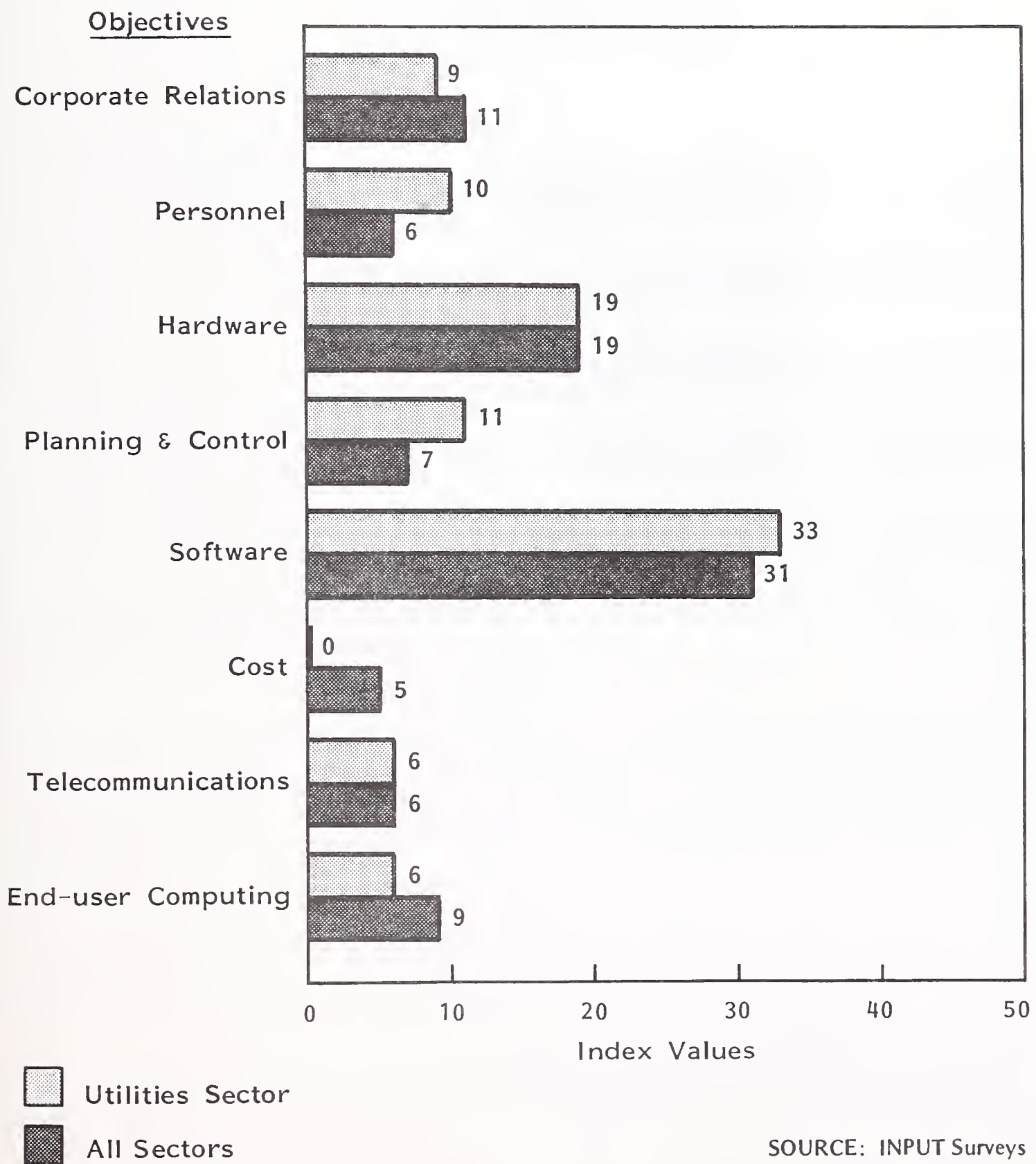
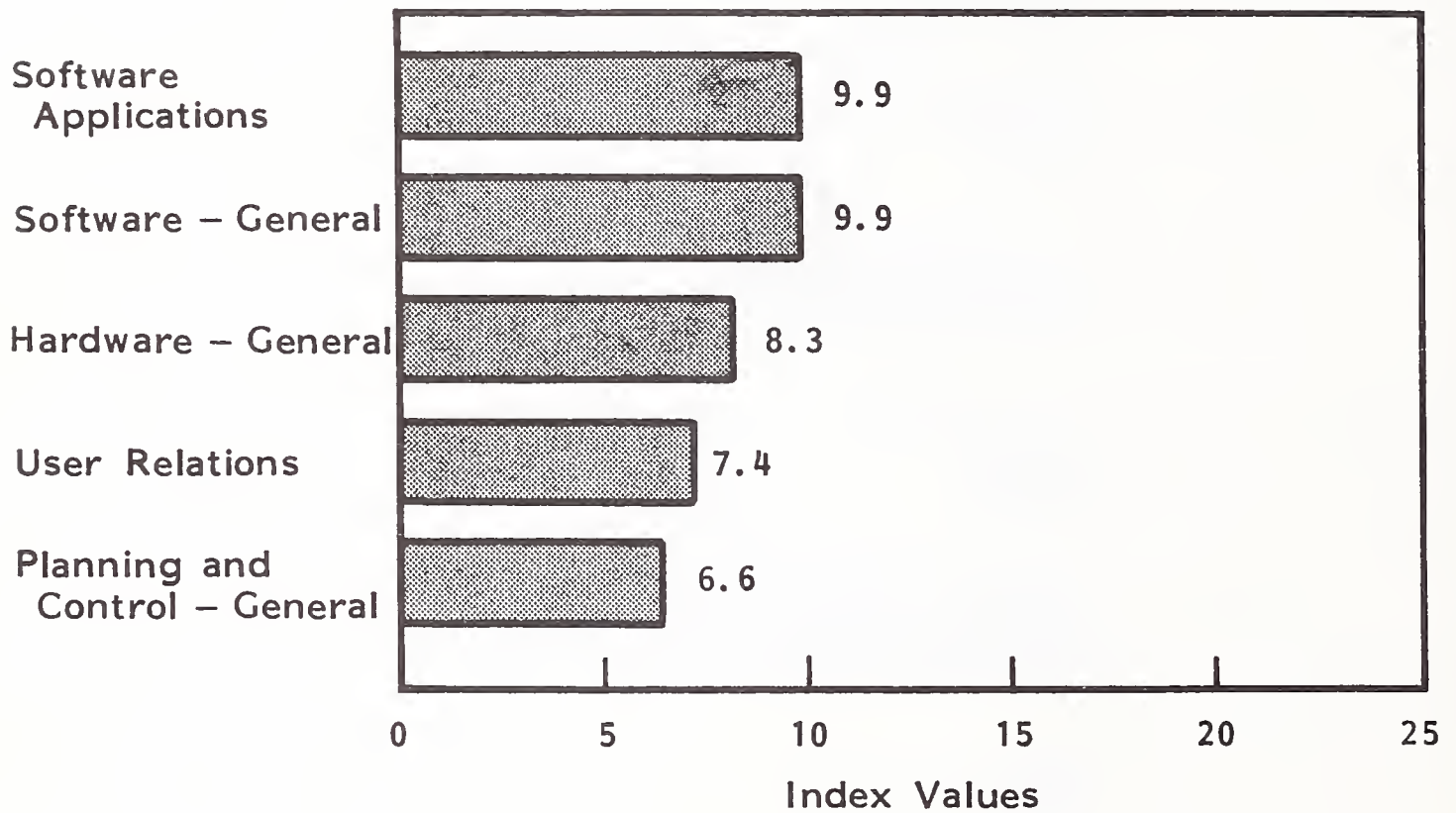


EXHIBIT IV-56

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
UTILITIES INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



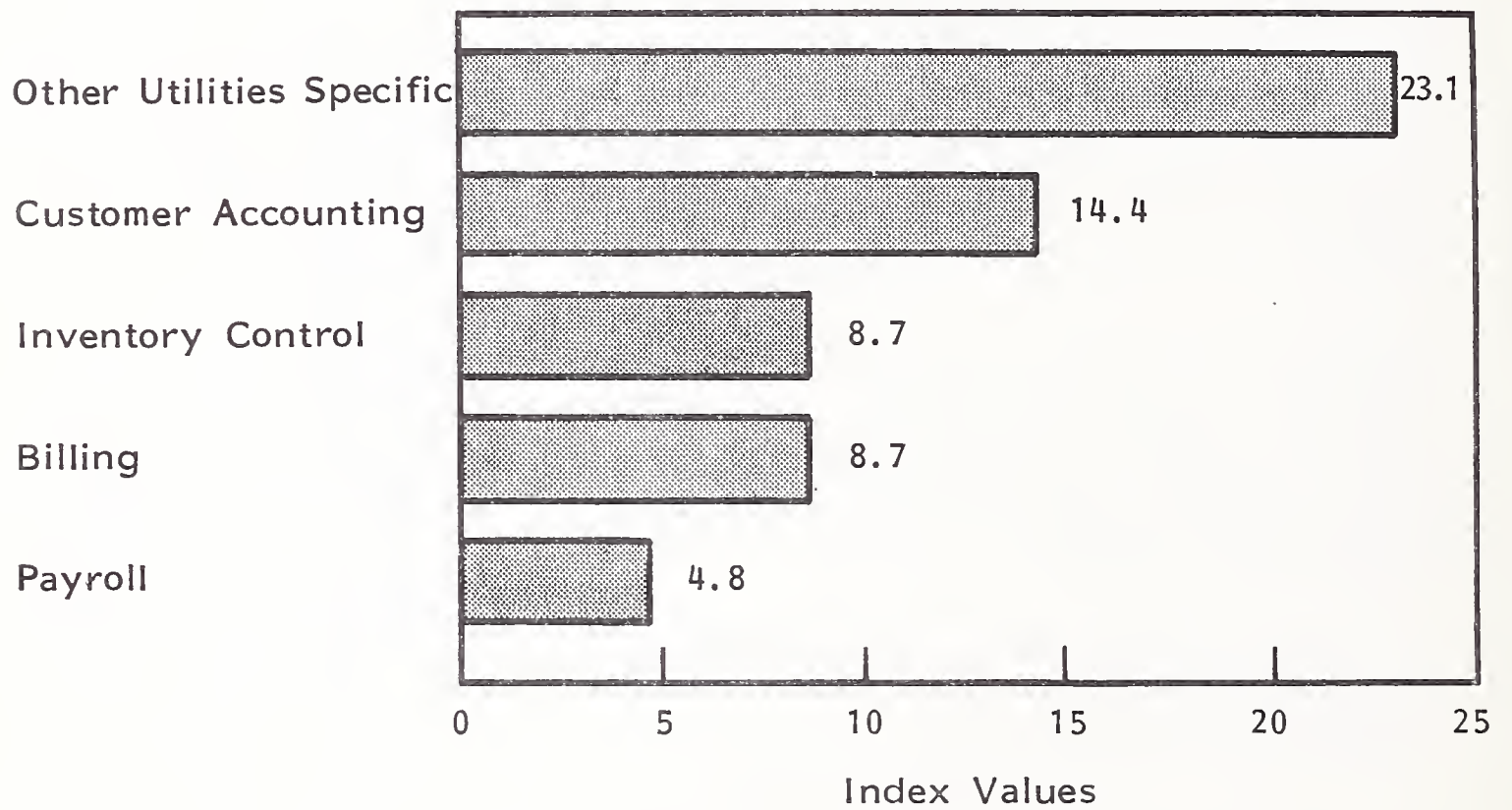
- Cost objectives are virtually nonexistent - no doubt an interesting revelation to senior corporate executives, who rate cost concerns very high.
- Exhibit IV-56 contains the planning issue subgroups that utility IS managers rate as their top objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the utilities industry are shown in Exhibit IV-57. Forty-three percent of the respondents said that they will be developing cross-industry applications, while the remaining 57% said they will be developing industry-specific applications.
- Information systems managers in the utilities industry plan to develop customer accounting and inventory control systems during the next year. Other utilities-specific applications include plant maintenance applications and simulation systems.
- Many information systems managers expect to develop billing and payroll applications in the next year.
- The most significant events affecting applications development within the companies interviewed were hardware upgrades, software applications, and operating systems. Also noted as significant was the problem of management turnover.
- Information systems managers in the utilities industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.

EXHIBIT IV-57

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE UTILITIES INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



- Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the utilities industry was regulation. The recession also affected applications development in the utilities industry.

5. END-USER COMPUTING

a. Office Systems

- The greatest office systems applications growth in the utilities sector will be seen in electronic mail, which is now used by a fifth of our respondents but which another third intend to be using by the end of 1984, as can be seen in Exhibit IV-58.
- Of course, word processors are already pervasive, but telecopier/facsimile penetration is also extremely high - four-fifths of our respondents are using them.
- LANs can now be found in about a third of the companies. Very few use televideo conferencing.

b. Personal Computers

- Over nine-tenths of our respondents in the utilities sector report personal computers in their organizations. On average, there are 125 PCs in each organizational entity; by 1986, there will be 276, reflecting a compound annual growth rate of 30%, as shown in Exhibit IV-59.
- About 3% of the personal computers in this sector communicate with other devices. Over half of our respondents report some links with in-house computers, two-fifths report links with other personal computers or word

EXHIBIT IV-58

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE UTILITIES INDUSTRY

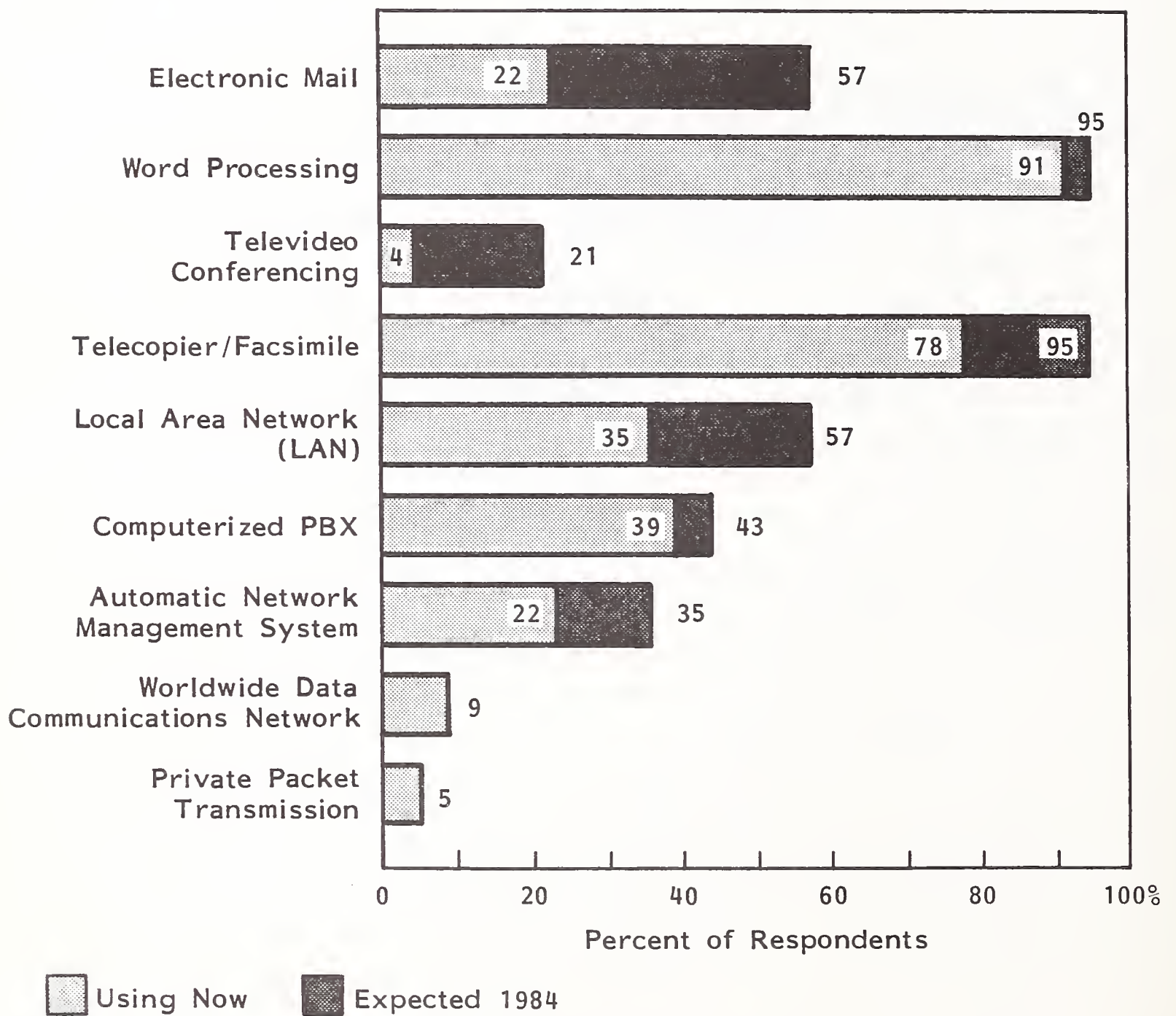
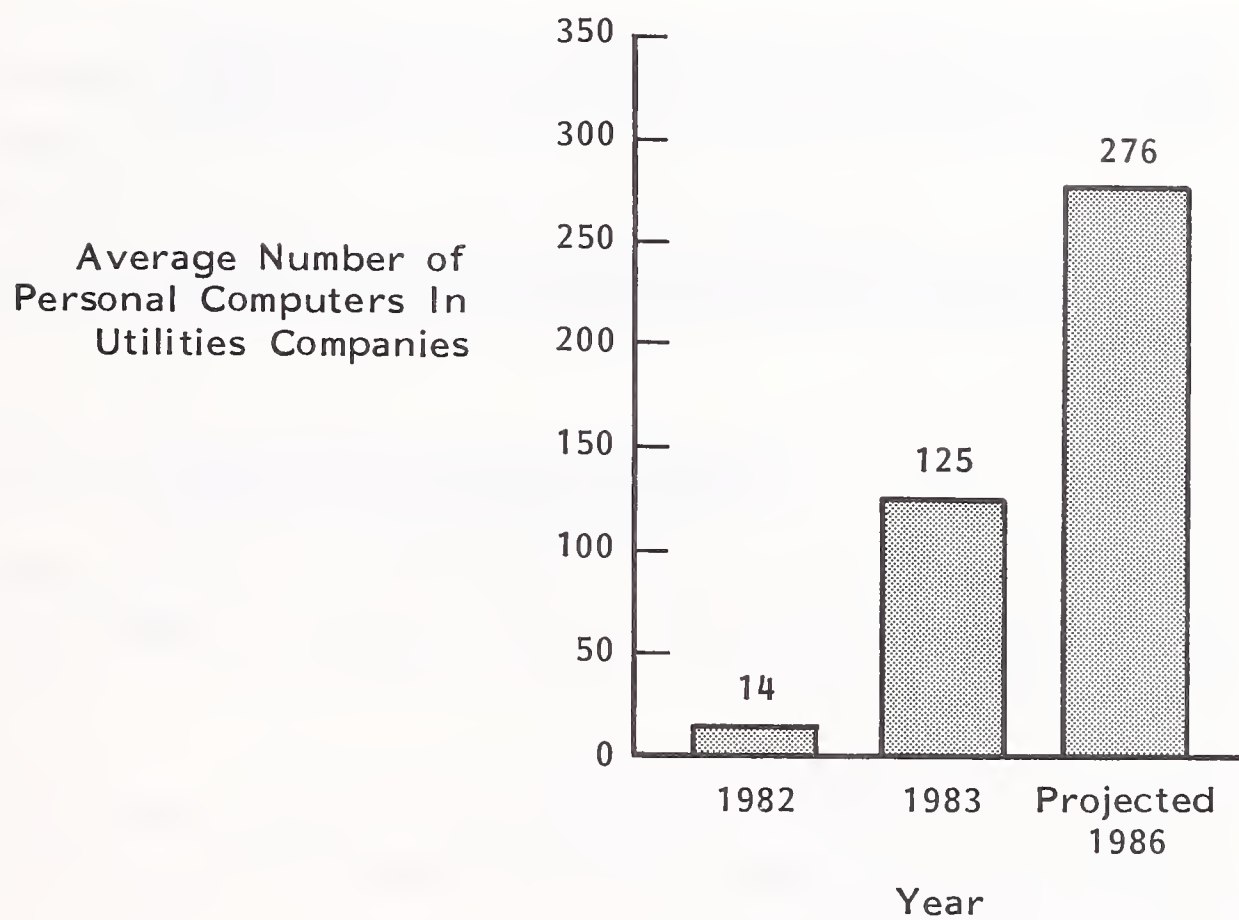


EXHIBIT IV-59

NUMBER OF PERSONAL COMPUTERS IN
UTILITIES SECTOR COMPANIES



Compound annual growth rate, 1983-1986: 30%

* Respondent Estimates

SOURCE: INPUT Survey

processors, and three-tenths have PCs communicating with outside services, as shown in Exhibit IV-60.

H. DISTRIBUTION SECTOR

I. INDUSTRY OVERVIEW

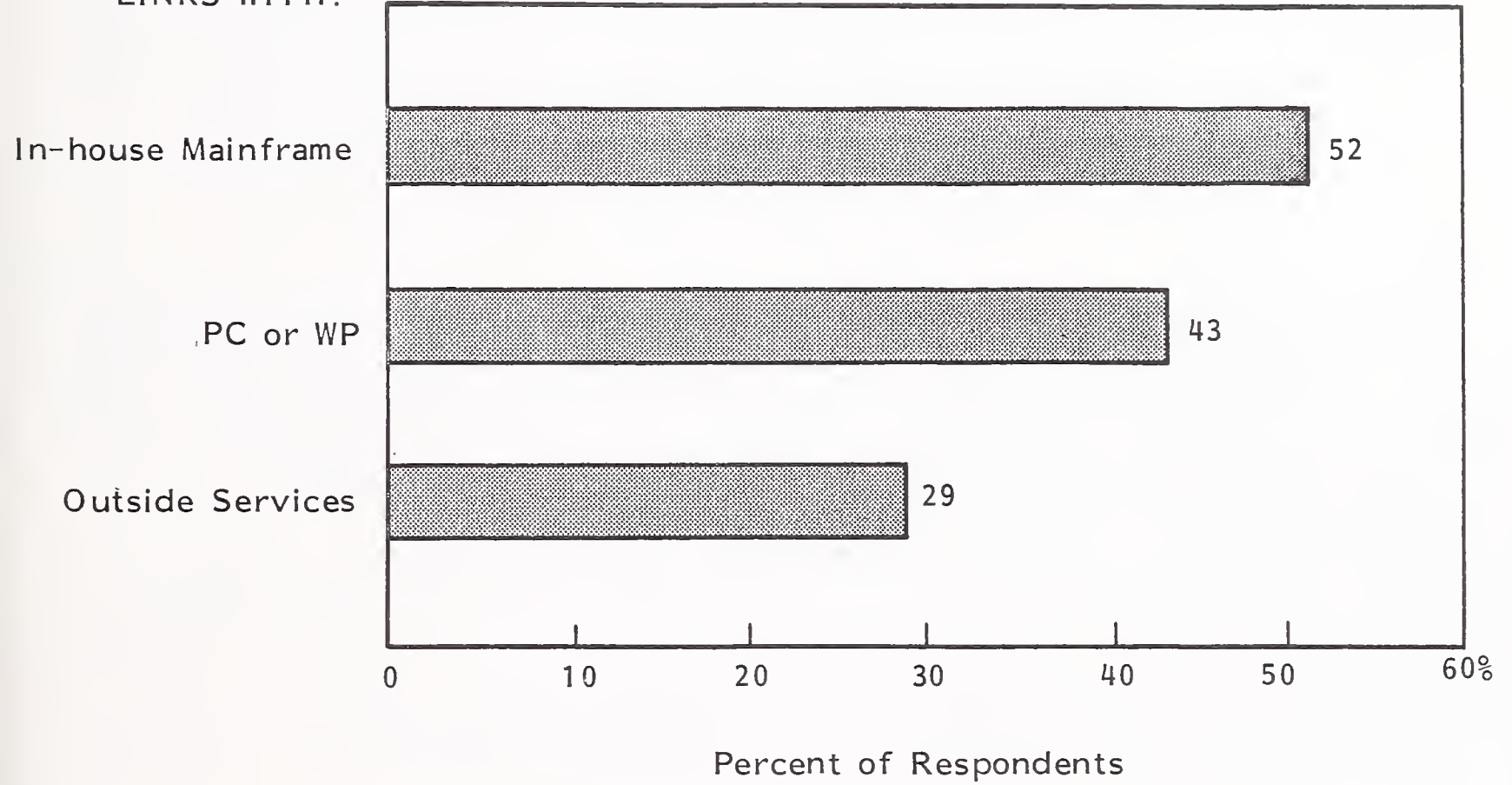
a. Retail Distribution

- 1982 consumer spending stagnated in spite of the mid-1982 federal income tax cut; retail sales in the first eight months of 1982 were 2.2% below the same period in 1981 after adjusting for inflation. Growing unemployment, high interest rates and state and local tax increases contributed to weakening consumer confidence and sluggish sales.
- In 1983 retail sales are going much better, and a strong 1984 is projected.
- Major challenges facing the retail distribution sector include adapting to the economic recovery and adjusting to the changing population age mixes and life-styles of consumers.
- Retailers are becoming increasingly sophisticated users of information systems. Scanner-equipped stores grew from some 200 in 1977 to 6,300 in 1982; by 1985, 8,000 stores should have scanners.
 - Retailers have begun to use the wealth of data provided by scanner systems to make management decisions: scanner systems help managers set reorder points, allocate shelf space, determine product mixes, and track purchasing patterns.

EXHIBIT IV-60

CURRENT PC COMMUNICATION
IN THE UTILITIES SECTOR

LINKS WITH:



Percent of PCs linked with other systems: 3%

SOURCE: INPUT Survey

- Some retailers are providing space in their stores for automated teller machines and a few are sponsoring pilot electronic funds transfer projects.
- Sears has introduced a broad array of financial products in its stores, including mutual and money-market funds, and life and casualty insurance.

b. Wholesale Trade

- Total sales by wholesalers dropped about 1% in 1982, but after-tax income rose slightly. Wholesalers have been hurt by high-interest rates and product liability concerns, but boosted by the 1981 Economic Recovery Act, which allowed quicker depreciations. This new law will improve cash flow and help provide funds for capital expansion and modernization.
- Productivity in this sector has been stagnant since 1973, partly because of financial pressures that have been relieved by the Recovery Act. Wholesalers are expected to work more aggressively at increasing productivity through innovation, diversification, new technologies, and new investment.
- Drug wholesalers are on the leading edge of this crusade. One company is linking stores to its warehouse with automated entry services, consolidating and modernizing distribution facilities, and adding new nondrug lines, such as nutritional foods, appliances, small electronic items, and school supplies and stationery.
- Other wholesalers are informing customers about their products by holding educational seminars.
- The outlook for wholesalers in the next few years is for moderate growth and increasing innovation, particularly via information systems.
 - Sophisticated techniques are being employed to collect and interpret market information.

- Customer analysis is growing more sophisticated.
- Information systems are being used for inventory control, management and planning, sales, purchasing and billing, market analysis, and account management.

2. BUDGET ANALYSIS

- In the distribution sector, 96% of the companies expect information systems budgets to increase in 1984 and 4% anticipate no change. None expect decreases. The average expectation for budget growth is 10%, slightly above the 7% expectation of all industries, and only slightly above 1983's 8% increase.
- The information systems budget as a percent of total distribution company revenue is 0.5% - half the 0.9% average of all industries.
- Exhibit IV-61 shows the distribution of expenses in distribution sector information systems budgets. This breakdown is very close to the average for all industries.
 - Spending on mainframes is dominant. Microcomputer expenditures are higher than in other industries (see Exhibit III-9).
 - Outside processing services and minicomputer spending are particularly low.
- Easily the largest relative increase in growth in 1984 will be for personal computers.
 - Mainframe, peripheral, communications, and maintenance expenditures will be higher than in other industries.

EXHIBIT IV-61

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE DISTRIBUTION SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	46.3%	8.4%
Mainframe Processors	9.8	9.2
Minicomputers	1.9	4.0
Micro-personal Computers	4.1	57.5
Terminals	3.1	3.3
Peripherals	6.8	6.4
Total Hardware	25.6%	8.3%
Communications	7.4	13.8
External Software	3.2	7.7
Custom Programming	2.7	(2.6)
Integrated Systems	0.3	1.5
Total Software	6.2%	8.5%
Software Maintenance	2.2	10.5
Hardware Maintenance	3.4	10.2
Total Maintenance	5.6%	9.9%
Outside Processing Services	0.5	1.2
Other	8.4	3.0
Total	100.0%	10.4%

- Custom programming spending will decrease.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- The importance attached to various information systems issues by senior corporate managers in the distribution sector closely mimic the norm of all sectors, as can be seen in Exhibit IV-62.
- The top concern is cost, followed by hardware, planning and control, and corporate relations.
- Telecommunications concern ranks high relative to other industries, primarily because of the high communications component in the distribution industry.

b. Problems

- Last year, personnel issues were the most important problem for distribution sector information systems managers. This year IS managers rated corporate relations as their highest concern - higher than for any other industry sector, as shown in Exhibit IV-63. User relations are the primary component of the corporate relations problem. Management relations are also important, however.
- Planning and control issues are also rated quite high, and are dominated by backlog issues.
- Telecommunications problems cause relatively high concern, as do hardware issues.

EXHIBIT IV-62

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE DISTRIBUTION SECTOR

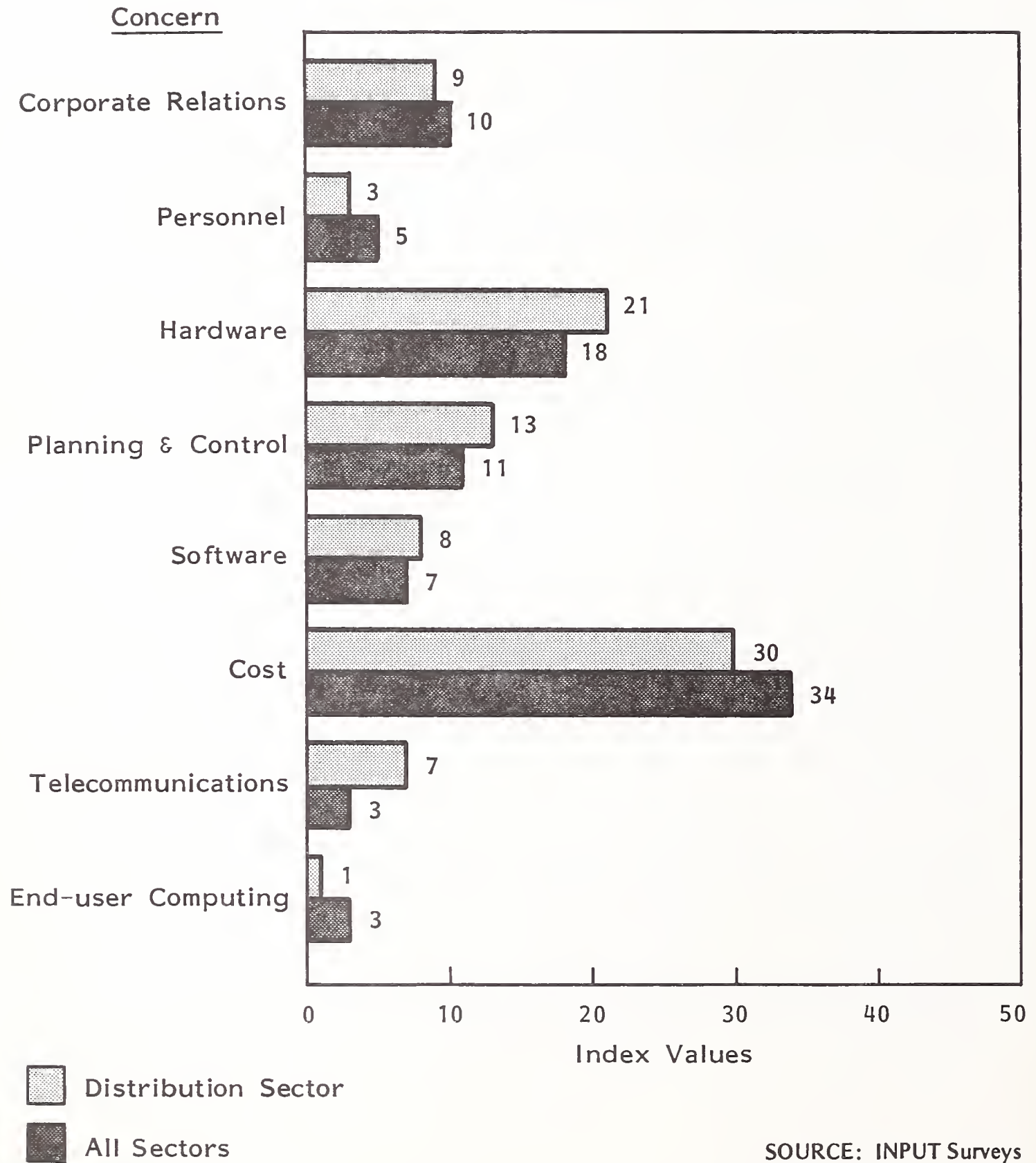
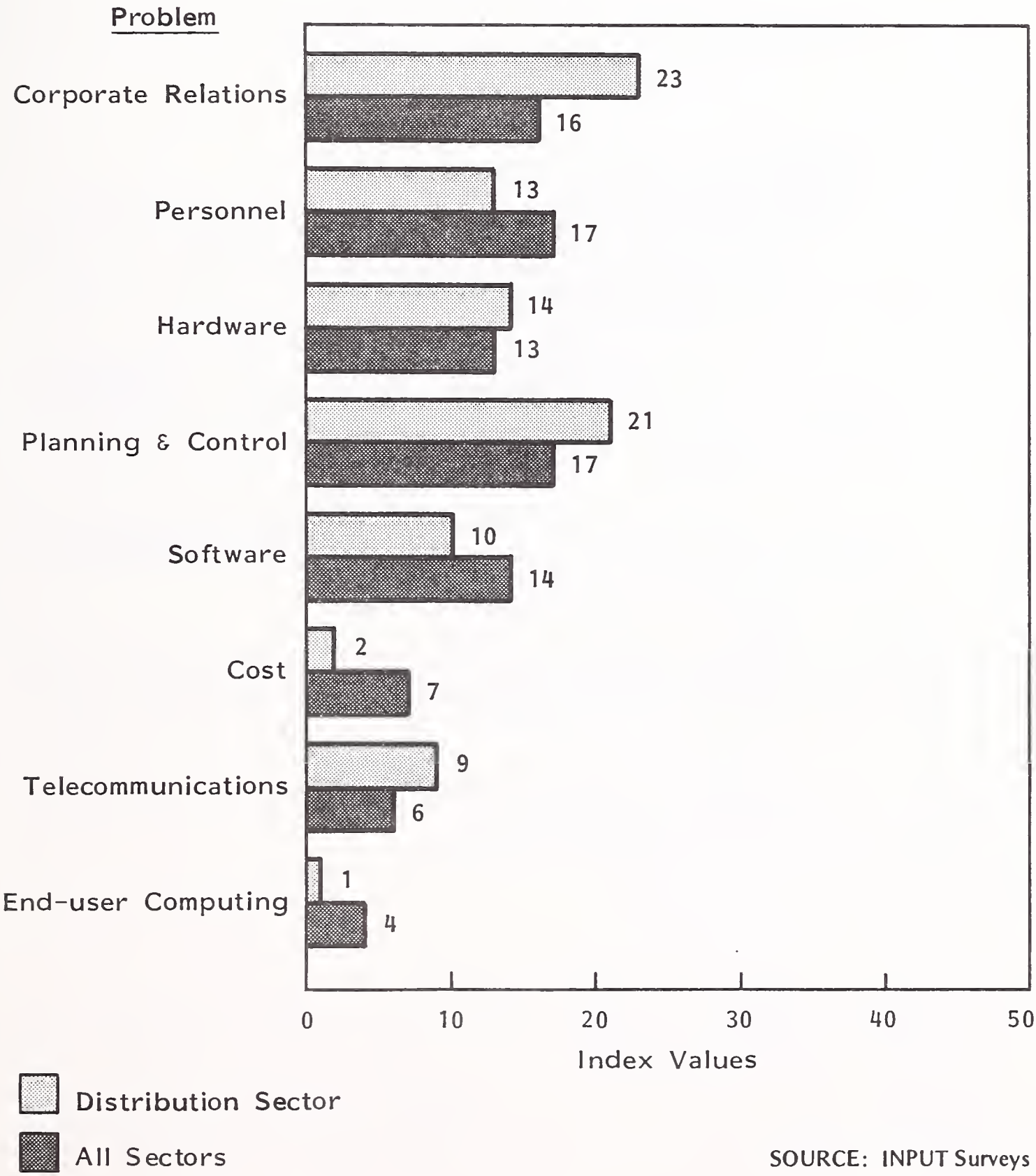


EXHIBIT IV-63

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE DISTRIBUTION SECTOR
(IMPORTANCE TO I.S. MANAGERS)



- The need for additional qualified personnel is a specific personnel issue that is causing considerable anxiety.
- Cost concerns do not faze distribution sector information systems managers - in sharp contrast to their bosses, who ranked them number one.
- Exhibit IV-64 contains the planning issue subgroups that the distribution IS managers rate as their top problems.

c. Objectives

- The high importance attached to software objectives parallels the industry norm, but hardware objectives rate an especially high second, as shown in Exhibits IV-65 and IV-66.
 - Software applications objectives dominate software objectives, but software development is also ranked high.
 - Hardware upgrades are the most important hardware-related objectives.
- Personnel, and planning and control objectives are ranked especially low, even though planning and control is considered a serious problem (Exhibit IV-63).
- Exhibit IV-66 contains the planning issue subgroups that the distribution IS managers rated as most important objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the distribution industry are shown in Exhibit IV-67. Fifty-one percent of the respondents said that they will be developing cross-industry applications, while the remaining 49% said they will be developing industry-specific applications.

EXHIBIT IV-64

TOP FIVE INFORMATION SYSTEMS PROBELMS FOR THE
DISTRIBUTION INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

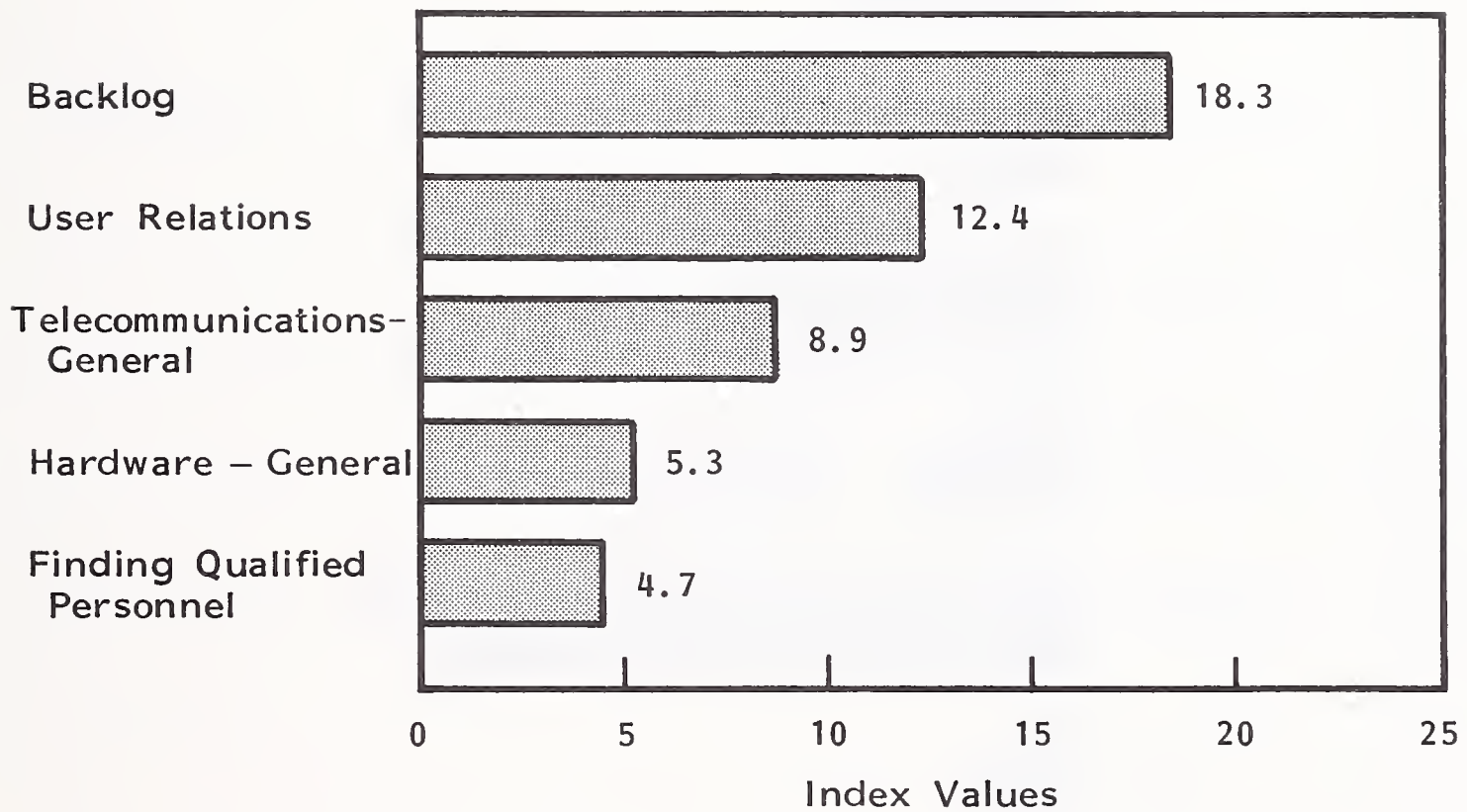


EXHIBIT IV-65

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES
IN THE DISTRIBUTION SECTOR
(IMPORTANCE TO I.S. MANAGERS)

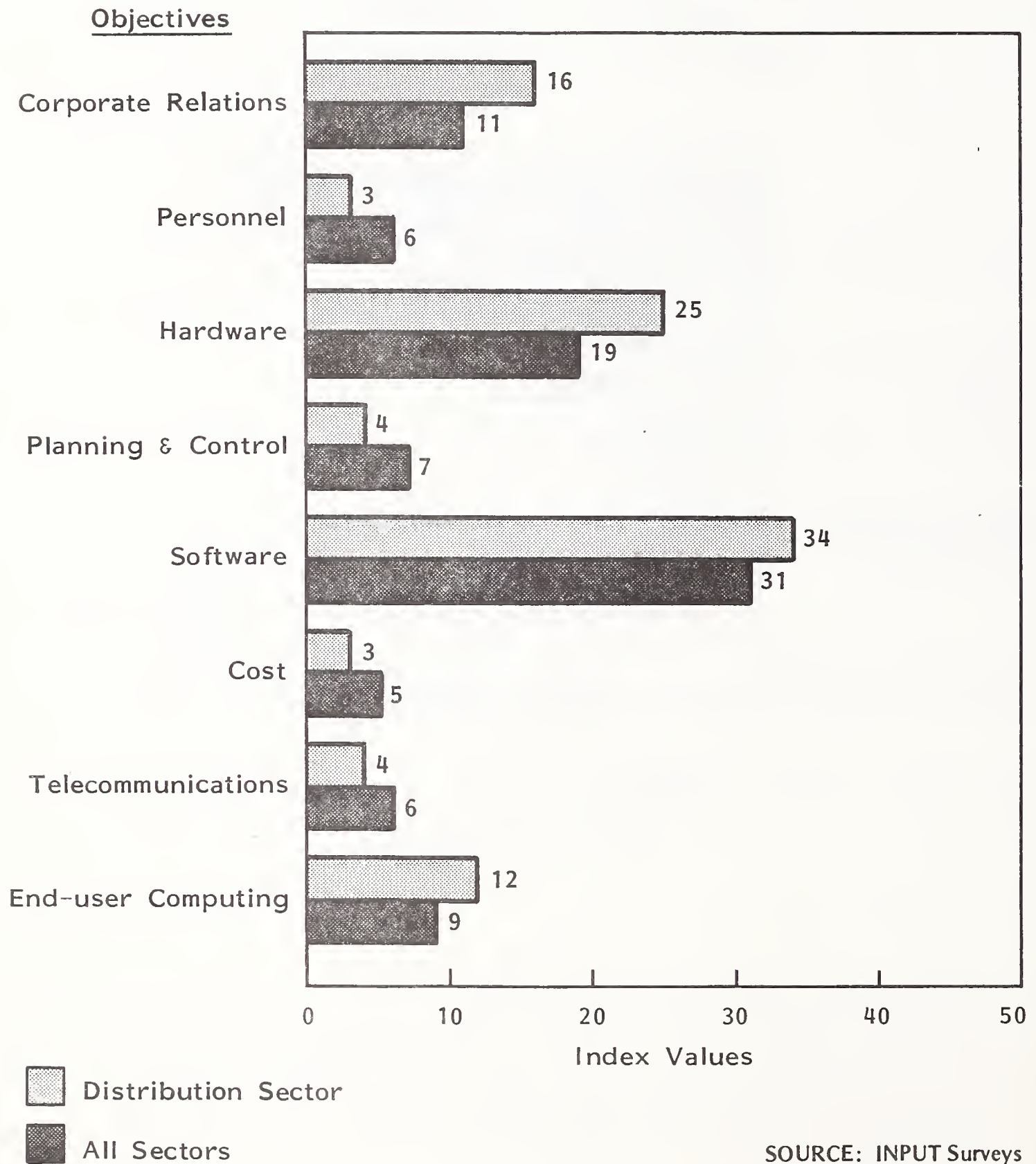


EXHIBIT IV-66

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
DISTRIBUTION INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

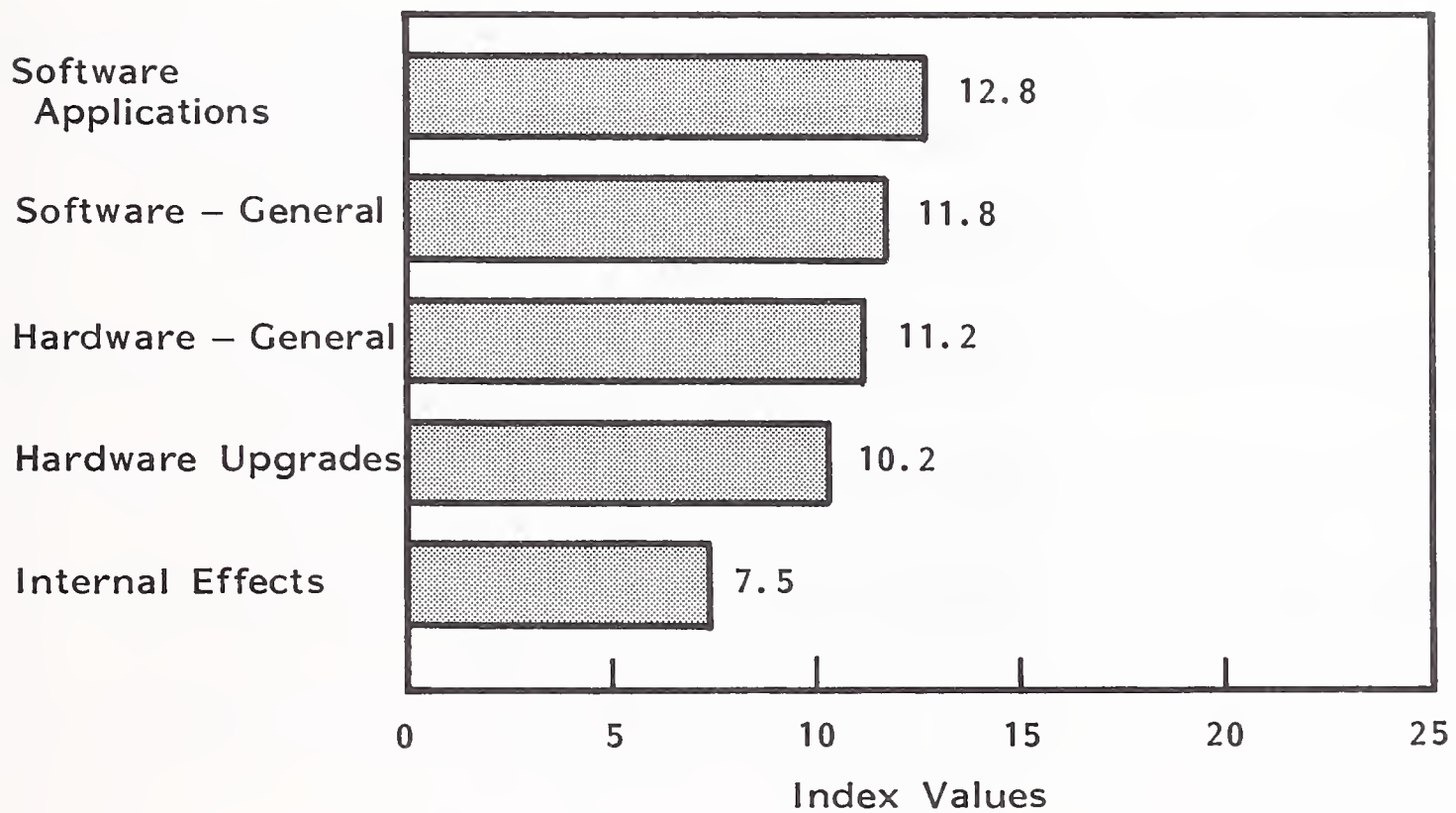
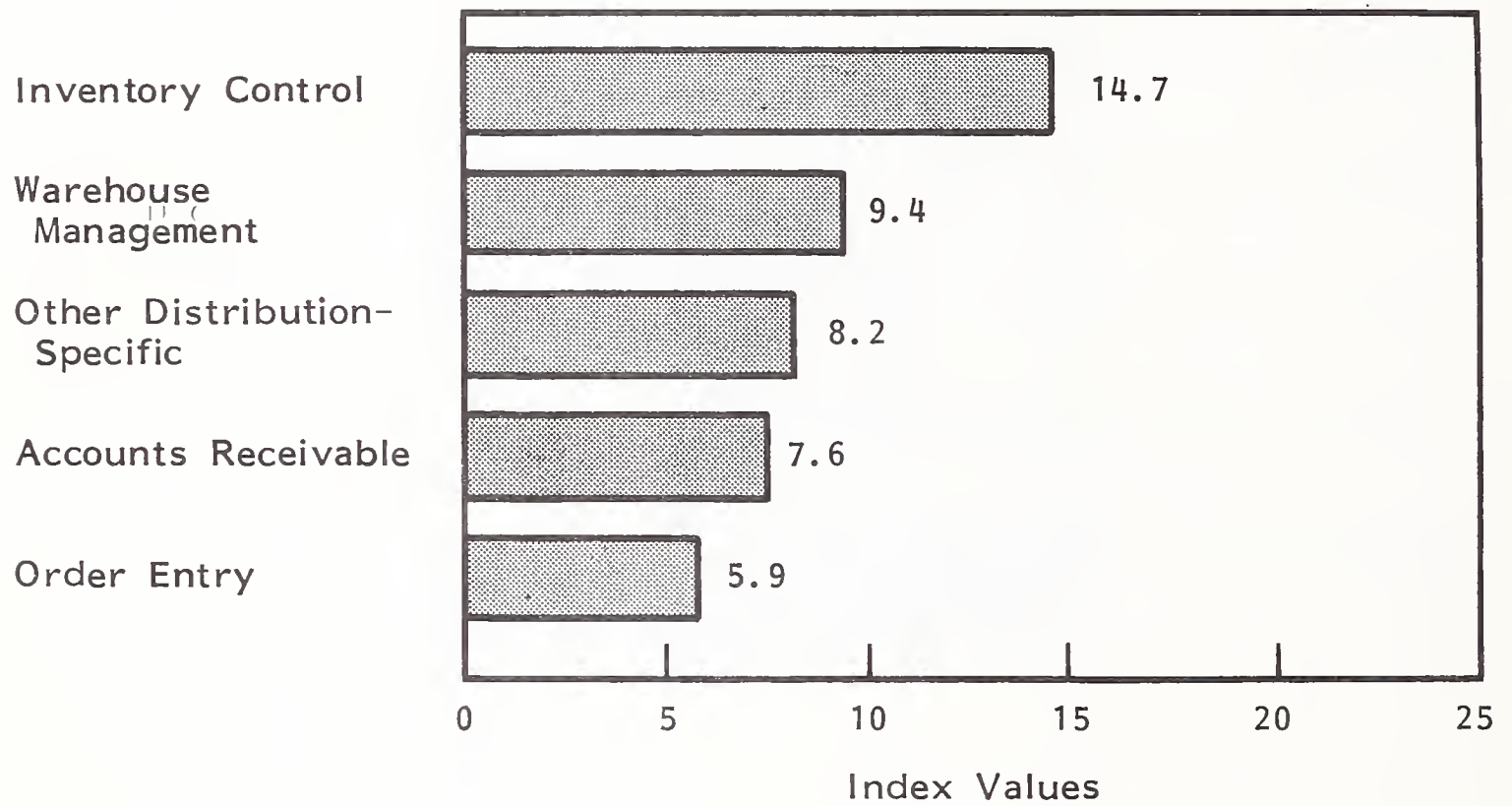


EXHIBIT IV-67

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE DISTRIBUTION INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



- Most of the respondents plan to develop inventory control and/or warehouse management applications. Material processing was also mentioned as an industry-specific application to be developed.
- Many information systems managers expect to develop order entry and accounts receivable applications in the next year. Data base management systems were mentioned by many of the respondents as affecting applications development.
- Information systems managers in the process manufacturing industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
- The most significant event affecting applications development within the distribution industry was the recovery.

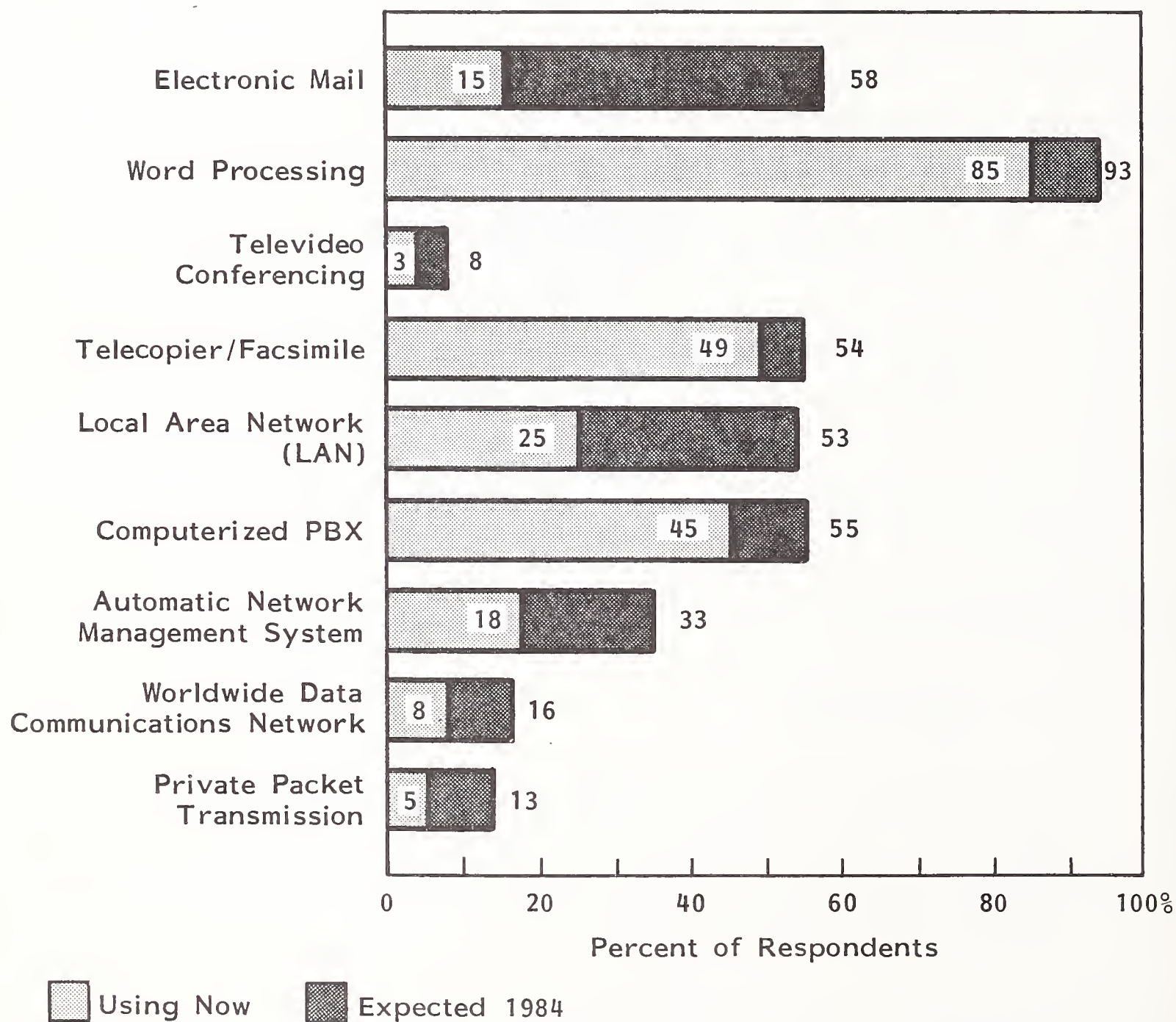
5. END-USER COMPUTING

a. Office Systems

- Electronic mail is the fastest growing office systems application in the distribution sector, with over two-fifths of our respondents reporting their intentions to install EM by the end of 1984, as can be seen from Exhibit IV-68. This is from a very small base, however.
- The most pervasive office system application in this sector is word processing. PBXs, and telecopiers and facsimile devices are in use in almost half our respondents' environments.

EXHIBIT IV-68

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE DISTRIBUTION INDUSTRY



- A quarter are using LANs and another quarter will have them by the end of 1984.
- Very few use televideo conferencing.

b. Personal Computers

- Almost eight-tenths of our respondents in the distribution sector report personal computers in their organizations. On average, there are 41 PCs in each organizational entity; by 1986, there will be 105, reflecting a compound annual growth rate of 37%, as shown in Exhibit IV-69.
- About 5% of the personal computers in this sector communicate with other devices. Almost two-fifths of our respondents report some links with in-house computers, a quarter report links with other personal computers or word processors, and a tenth have PCs communicating with outside services, as shown in Exhibit IV-70.

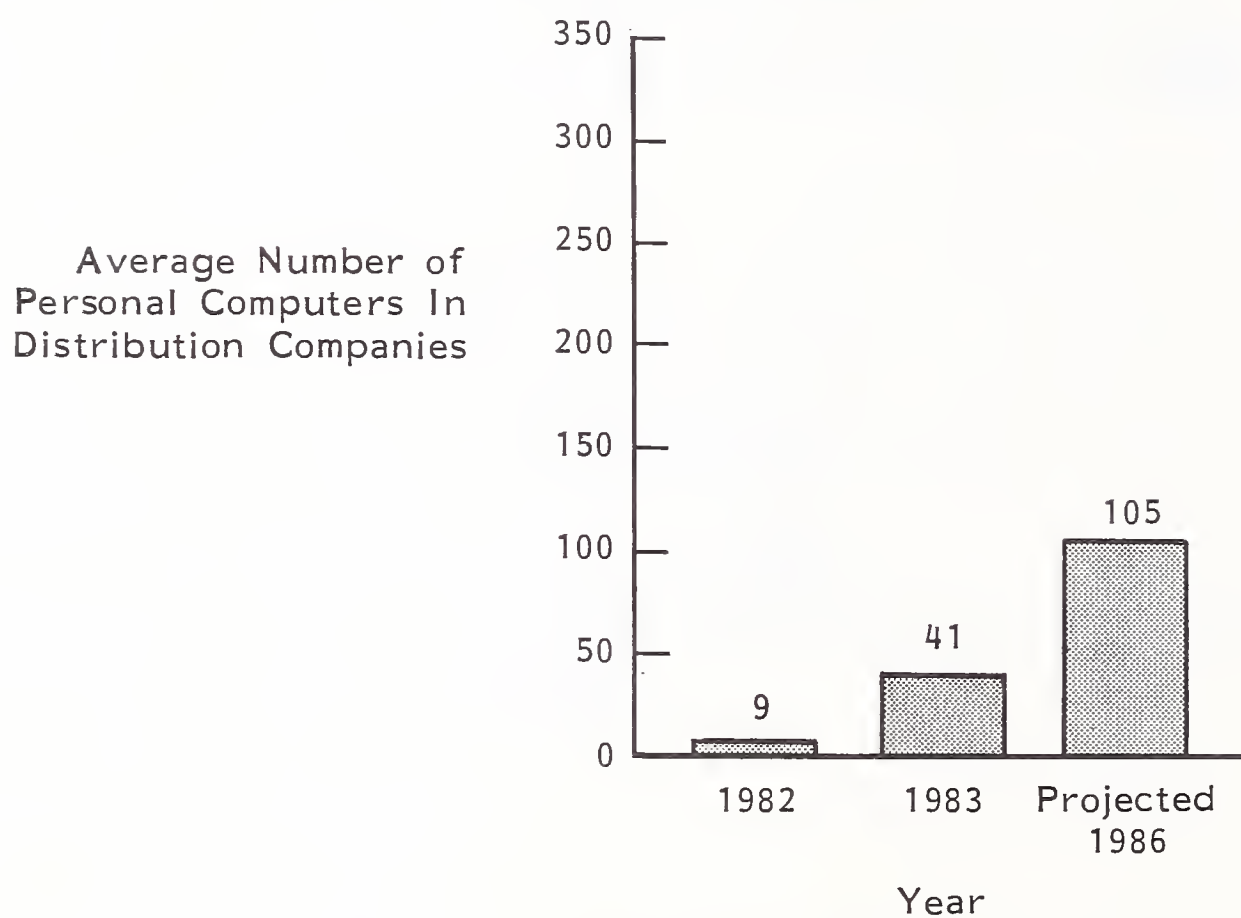
I. BANKING AND FINANCE INDUSTRY SECTOR

I. INDUSTRY OVERVIEW

- Mergers, acquisitions, continuing deregulation, and a more rapid assimilation of technology have combined to make this year one of the most dynamic in the history of American banking and finance. These changes will have great impact on the information systems resources of these companies.
- The entry of banks into the brokerage business, the freeing of interest rates, and the murmurings of interstate banking will all require significant new information services support.

EXHIBIT IV-69

NUMBER OF PERSONAL COMPUTERS IN
DISTRIBUTION SECTOR COMPANIES



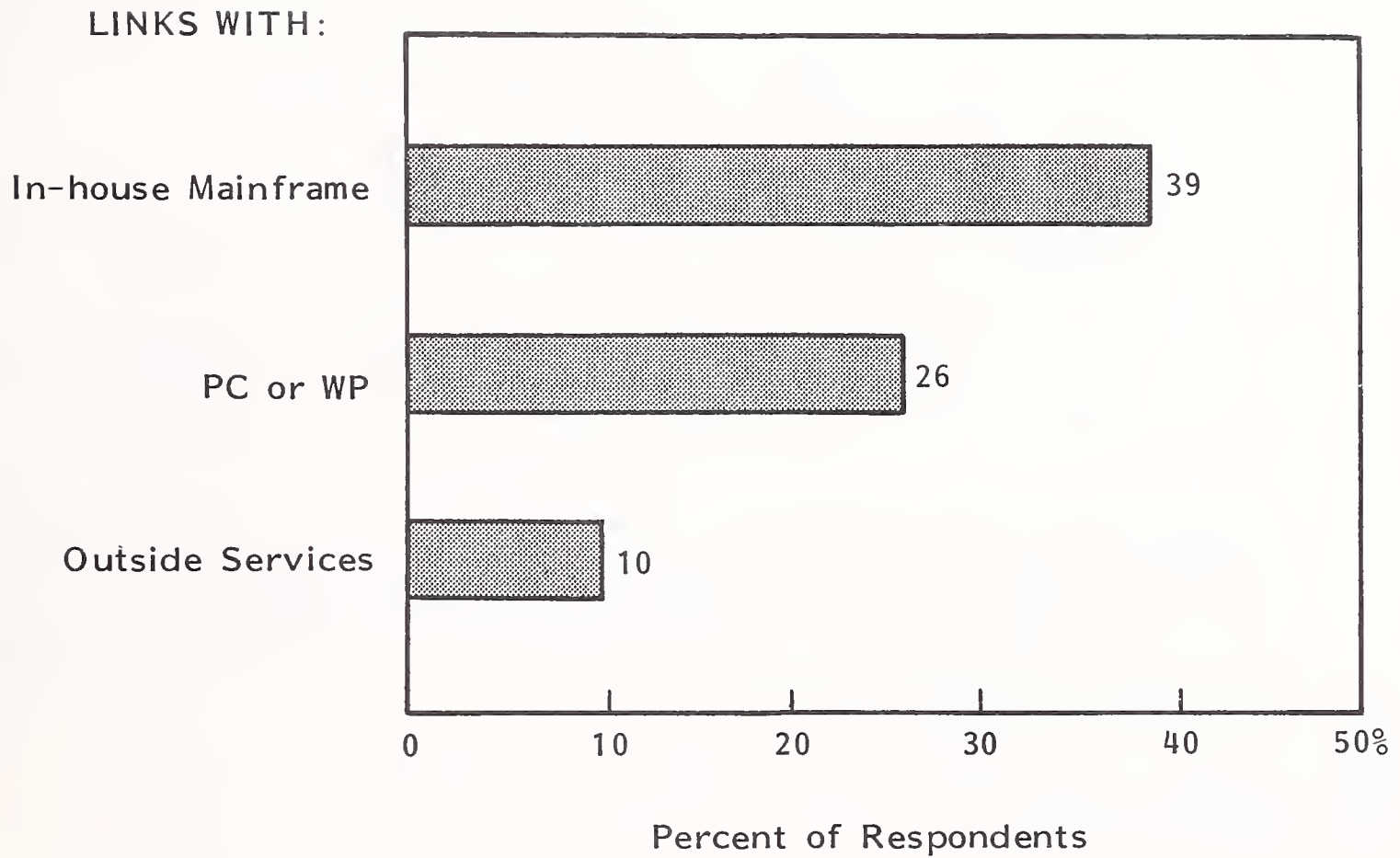
Compound annual growth rate, 1983-1986: 37%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-70

CURRENT PC COMMUNICATION
IN THE DISTRIBUTION SECTOR



Percent of PCs linked with other systems: 5%

SOURCE: INPUT Survey

- Banks are assimilating new technologies at an increasing rate as they begin to use these technologies as competitive weapons. Again, significant new demands on corporate information systems resources will be an inevitable outcome of this development.
 - INPUT projects that Automatic Teller Machine (ATM) installations will increase 15,000 in 1983 to a year-end total of 50,000. Banks are installing more ATMs because of competitive pressure from other banks and because of the desire to cut costs by displacing tellers.
 - In the past year there has been rapid development of nationwide ATM networks.
 - Home banking and point-of-sale (POS) systems are beginning to be taken out of the laboratories and placed into commercial operation.
- IS departments will develop new retail applications (such as those simplifying retail fund access and transfer), new cash management systems, and new trust and securities applications. IS departments will also be pressured to develop a high degree of system integration.

2. BUDGET ANALYSIS

- In the banking and finance sector, 97% of the companies expect information systems budgets to increase in 1984. Three percent of companies anticipate declines.
 - The average expectation for budget growth in 1984 is 10%, slightly above the 7% average for all industries.
 - Spending in 1983 also grew 10%.

- The information systems budget as a percent of total banking and finance company assets is .2%.
- Exhibit IV-71 shows the distribution of expenses in banking and finance sector information systems budgets. This breakdown varies from the average for all industries in several particulars.
 - Spending on maintenance and terminals is considerably higher than normal (Exhibit III-9).
 - Minicomputers and outside processing services spending are much less than in other industries.
- Spending on mini and microcomputers will grow significantly in 1984. Software, maintenance, and communications expenditure growth will also be large.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Senior managers in the banking and finance sector follow most other industries in the importance they attach to various information services issues, ranking cost as their top concern, followed by hardware and corporate relations, as shown in Exhibit IV-72.
- Relatively little concern is expressed within this sector for planning and control issues.

b. Problems

- Information systems managers in banking and finance firms express their greatest concern for planning and control issues, as shown in Exhibit IV-73.

EXHIBIT IV-71

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE BANKING AND FINANCE SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	41.0%	8.6%
Mainframe Processors	9.6	4.7
Minicomputers	0.8	17.0
Micro-personal Computers	2.1	14.2
Terminals	5.3	5.7
Peripherals	7.3	4.3
Total Hardware	25.1%	7.2%
Communications	9.3	10.4
External Software	2.7	11.2
Custom Programming	2.1	7.6
Integrated Systems	0.0	0.0
Total Software	4.9%	8.2%
Software Maintenance	2.4	10.3
Hardware Maintenance	6.0	7.6
Total Maintenance	8.3%	8.0%
Outside Processing Services	1.0	7.8
Other	10.5	8.1
Total	100.0%	9.6%

EXHIBIT IV-72

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS
IN THE BANKING AND FINANCE SECTOR

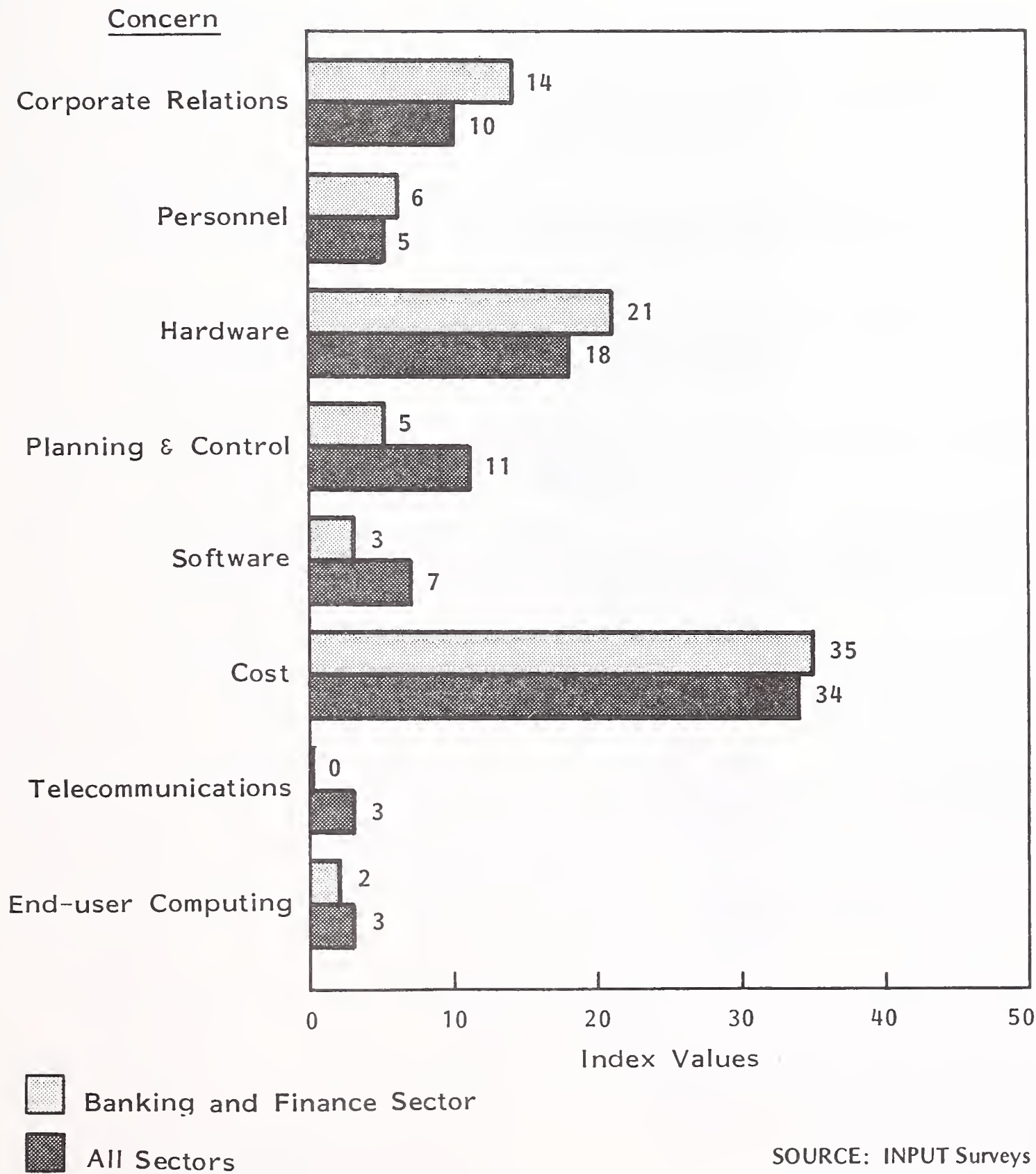
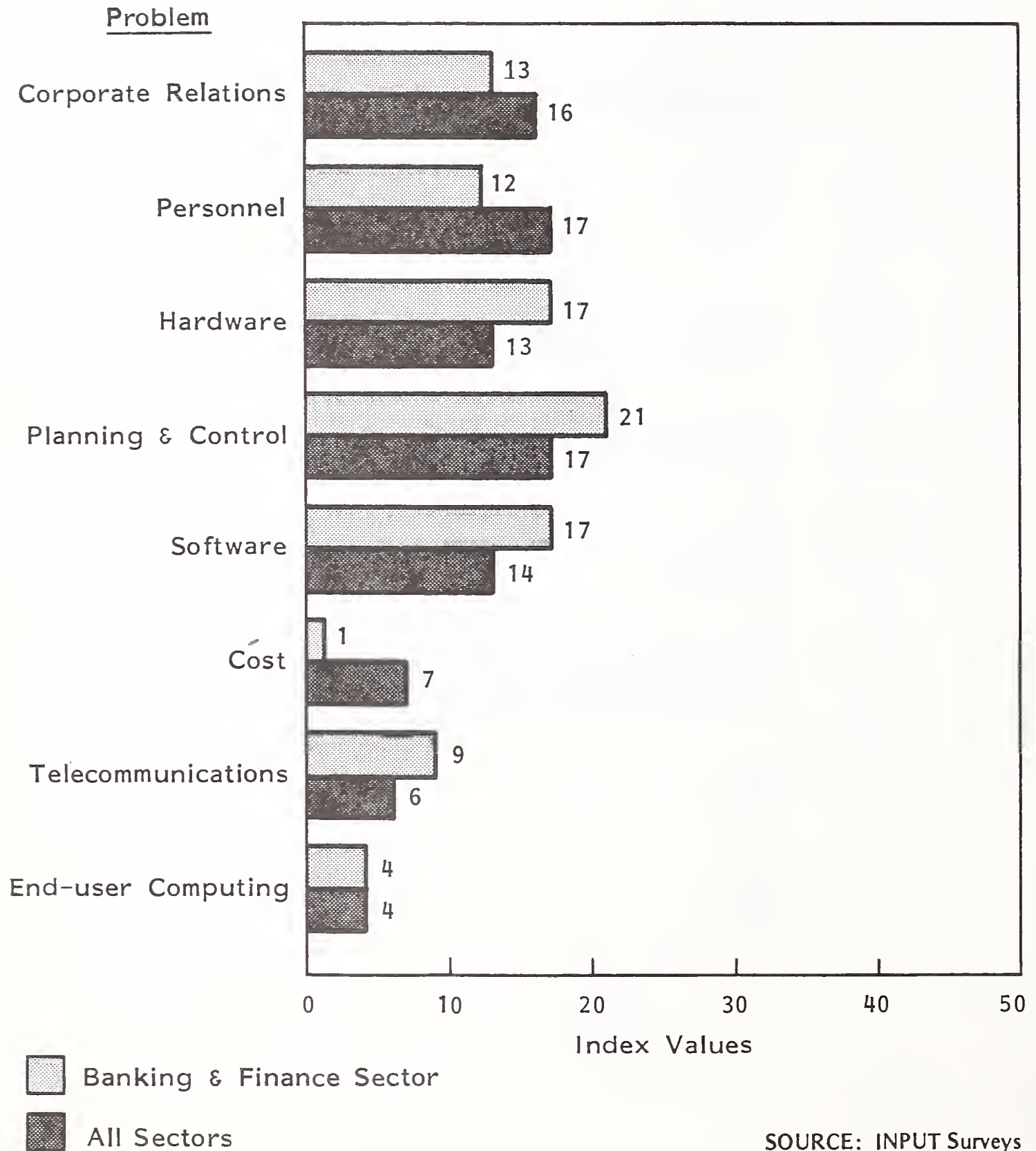


EXHIBIT IV-73

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS IN THE BANKING AND FINANCE SECTOR (IMPORTANCE TO I.S. MANAGERS)



- This is in sharp contrast to the lack of interest in this area expressed by senior corporate executives; the difference can be explained by the high importance attached by information systems managers to backlog problems, which do not concern senior executives.
- Software and hardware problems are also rated high. Telecommunications is rated higher as a concern by this sector than by almost all other sectors. Training of personnel is an issue of particular concern to managers.
- However, IS managers are relatively insensitive to cost issues and less concerned with general personnel problems than are IS managers of other sectors.
- Exhibit IV-74 enumerates the planning issue subgroups that banking/finance IS managers rate as their top problems.

c. Objectives

- Greatest priority is placed on software objectives, followed by hardware, corporate relations, and end-user computing, as shown in Exhibit IV-75.
- Little concern is expressed for planning and control objectives in spite of the weight attached to problems in this area. Cost objectives are also rated relatively low.
- Exhibit IV-76 lists the planning issue subgroups that the banking/finance IS managers rate as their top objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the banking and finance industry are shown in Exhibit IV-77. Forty-four percent of the respondents said that they will be developing cross-industry applica-

EXHIBIT IV-74

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
BANKING AND FINANCE INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

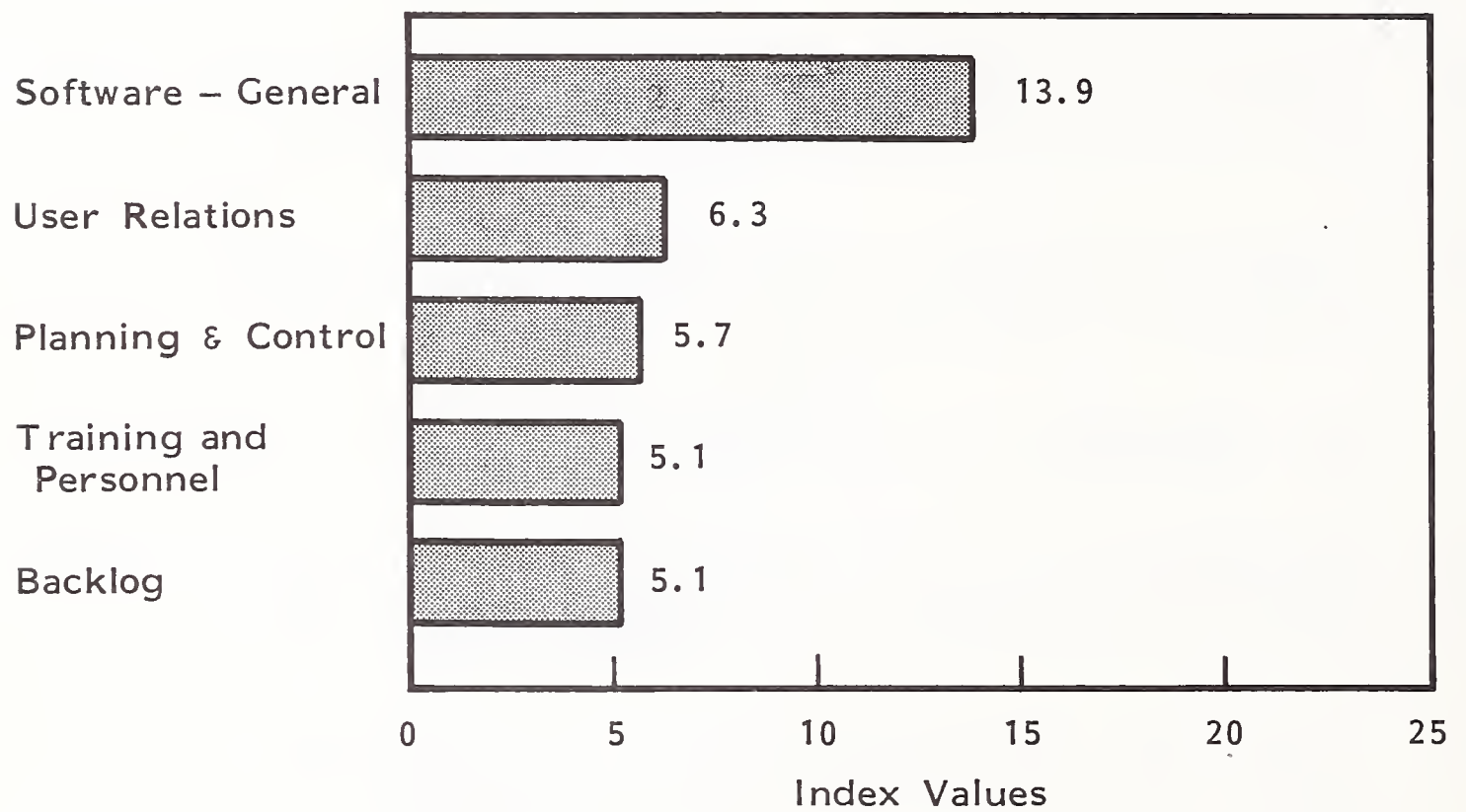


EXHIBIT IV-75

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES IN THE BANKING AND FINANCE SECTOR (IMPORTANCE TO I.S. MANAGERS)

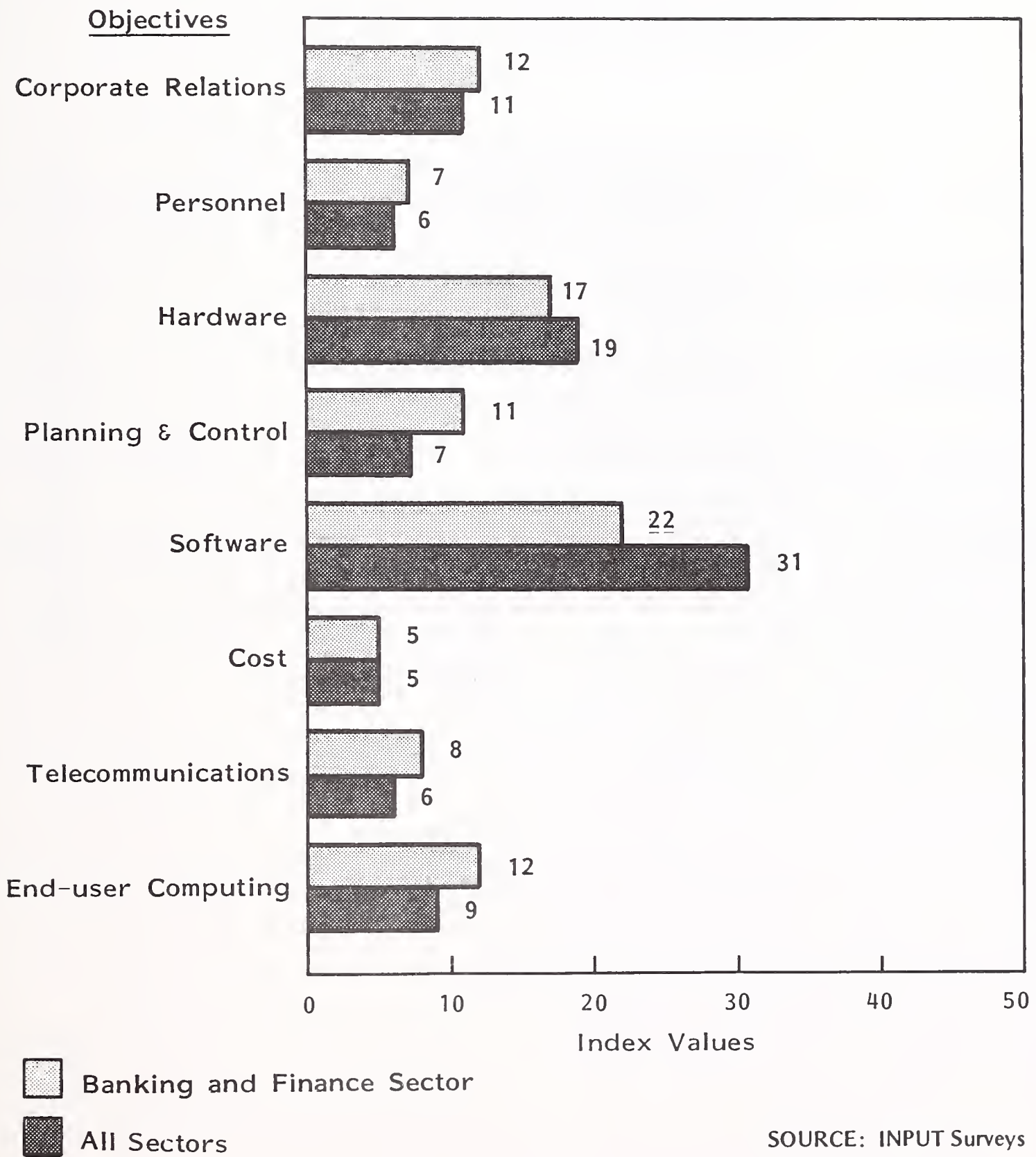


EXHIBIT IV-76

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE BANKING AND FINANCE INDUSTRY (IMPORTANCE TO I.S. MANAGERS)

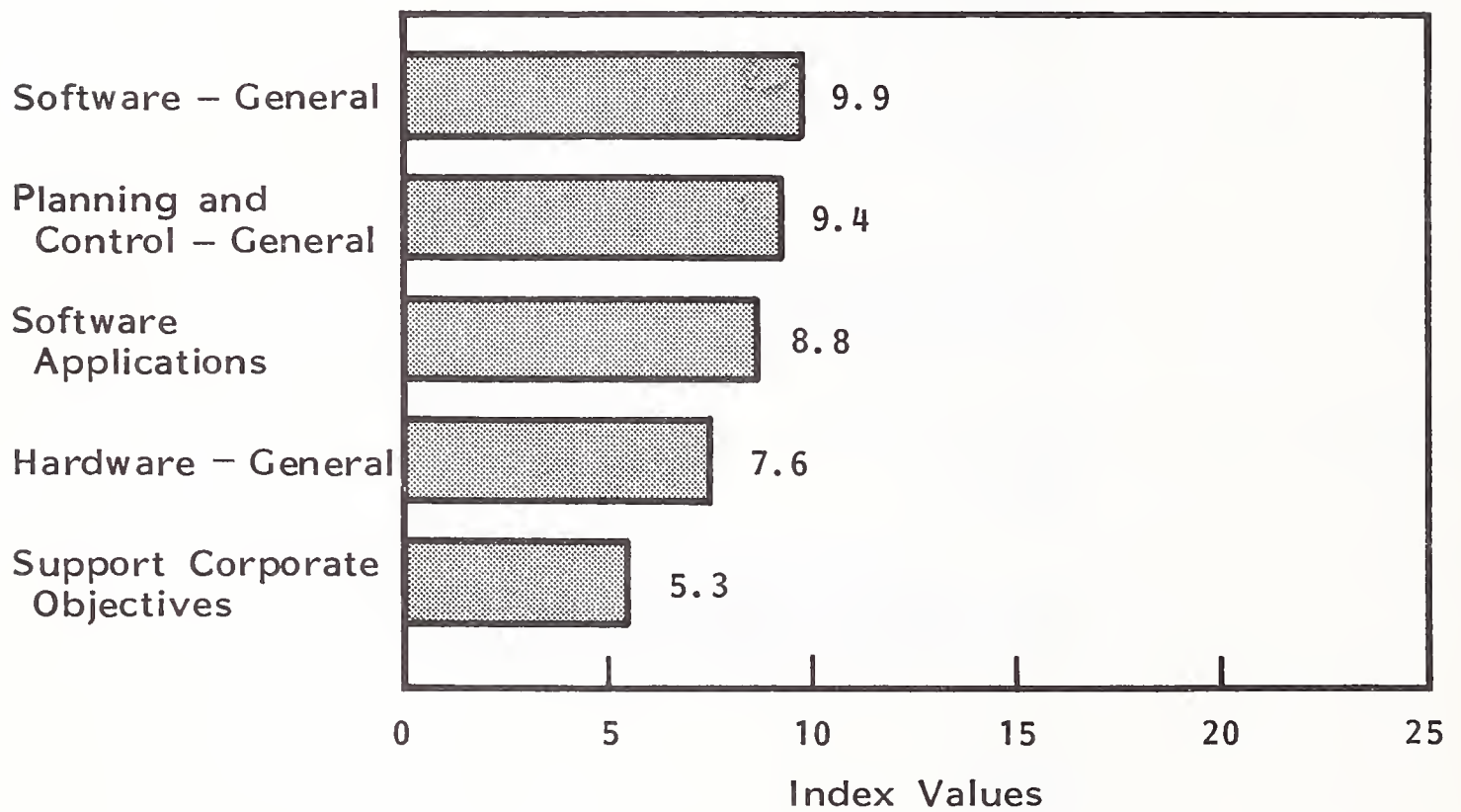
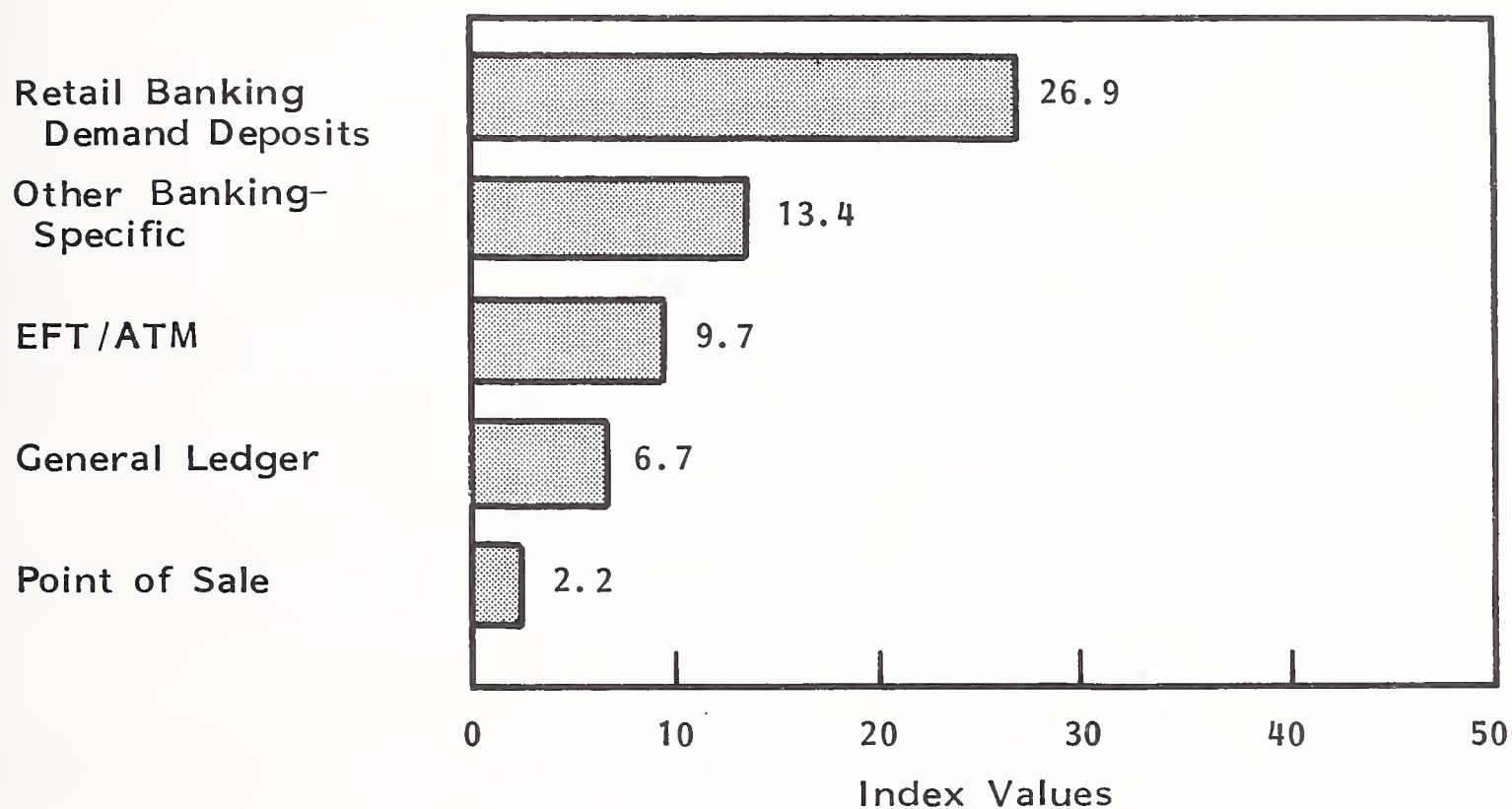


EXHIBIT IV-77

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE BANKING AND FINANCE INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



tions, while the remaining 66% said they will be developing industry-specific applications.

- Retail banking by far is the hottest group of applications that will be developed during the next 12 months. Retail banking includes such applications as loan and demand deposit transaction processing, and traveler's checks merchandising. Also being considered for 1984 are electronic fund transfer and automatic teller applications. Other banking-specific applications include consumer finance systems and contemporaneous reserve accounting.
- Many information systems managers expect to develop general ledger and cash management applications in the next year.
- Changes in government regulations, particularly the 10% withholding tax, affected most of the respondents' application development in the last year. Also mentioned as significant were organizational changes that are the result of competition.
- Information systems managers in the process manufacturing industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
- The most significant events affecting applications development within the banking and finance industry were deregulation and the 10% withholding tax law.

5. END-USER COMPUTING

a. Office Systems

- The greatest growth in office systems applications in the banking and finance sector will be seen in electronic mail, which over two-fifths of our respondents intend to install by the end of 1984, in addition to the fifth who already have these systems, as can be seen in Exhibit IV-78.
- Of course, word processors are already pervasive in this sector. PBXs and LANs also enjoy relatively high penetration.
- Not many bankers are using televideo conferencing.

b. Personal Computers

- Over nine-tenths of our respondents in the banking and finance sector report personal computers in their organizations. On average, there are 36 PCs in each organizational entity; by 1986, there will be 104, reflecting a compound annual growth rate of 42%, as shown in Exhibit IV-79.
- About 6% of the personal computers in this sector communicate with other devices. Over a third of our respondents report some links with in-house computers, two-tenths report links with other personal computers or word processors, and over a sixth have PCs communicating with outside services, as shown in Exhibit IV-80.

EXHIBIT IV-78

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE BANKING AND FINANCE INDUSTRY

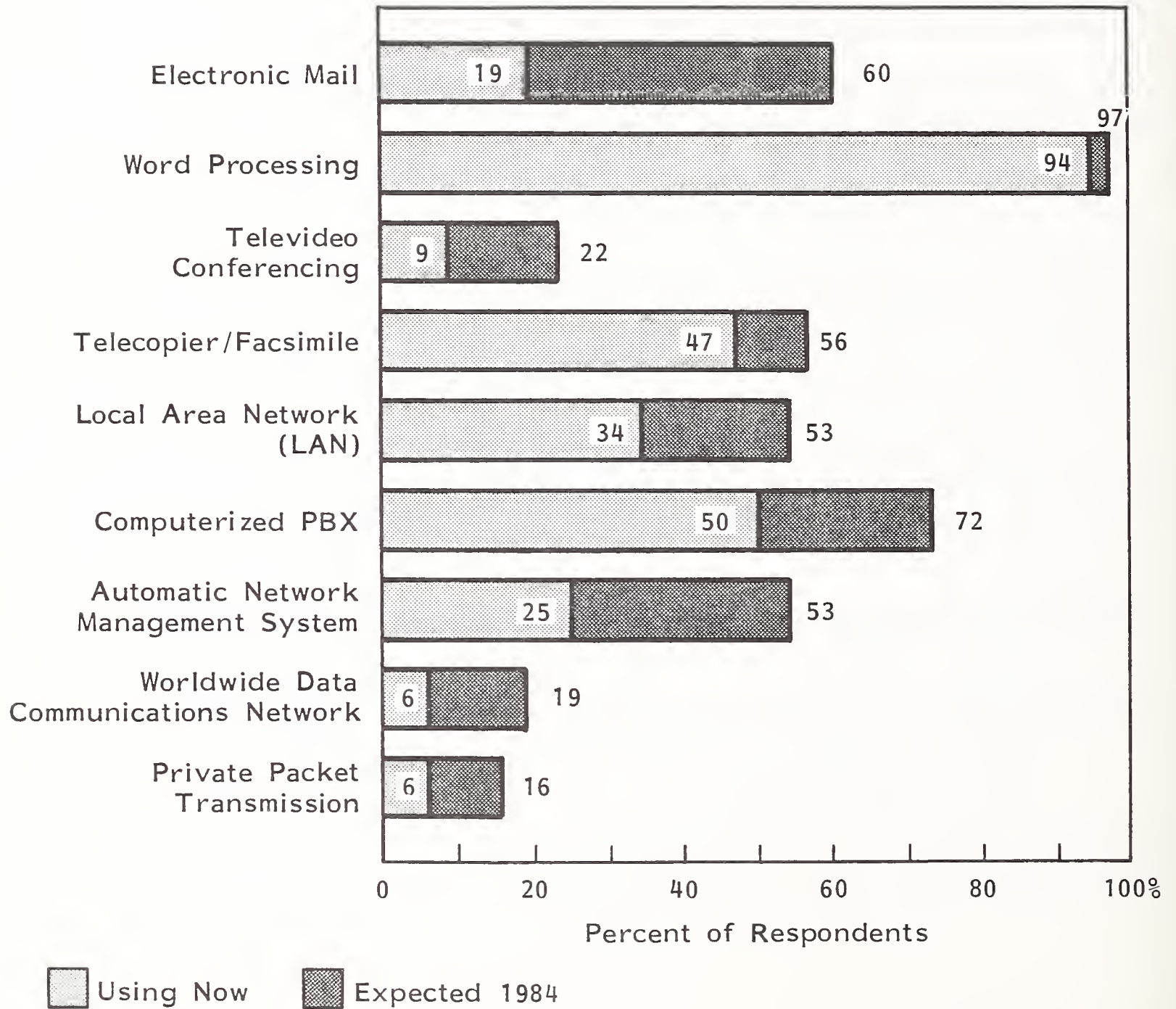
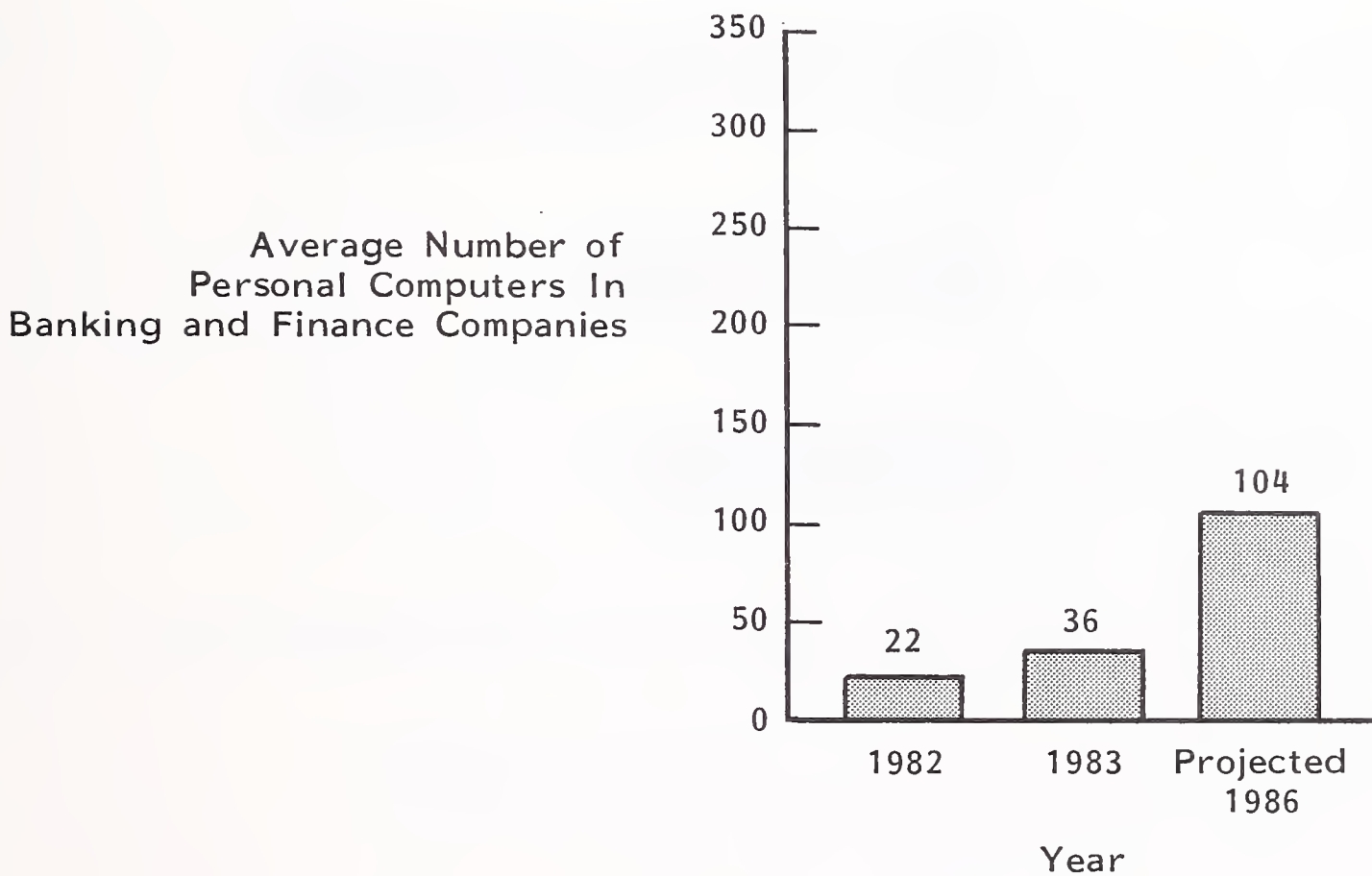


EXHIBIT IV-79

NUMBER OF PERSONAL COMPUTERS IN
BANKING AND FINANCE SECTOR COMPANIES



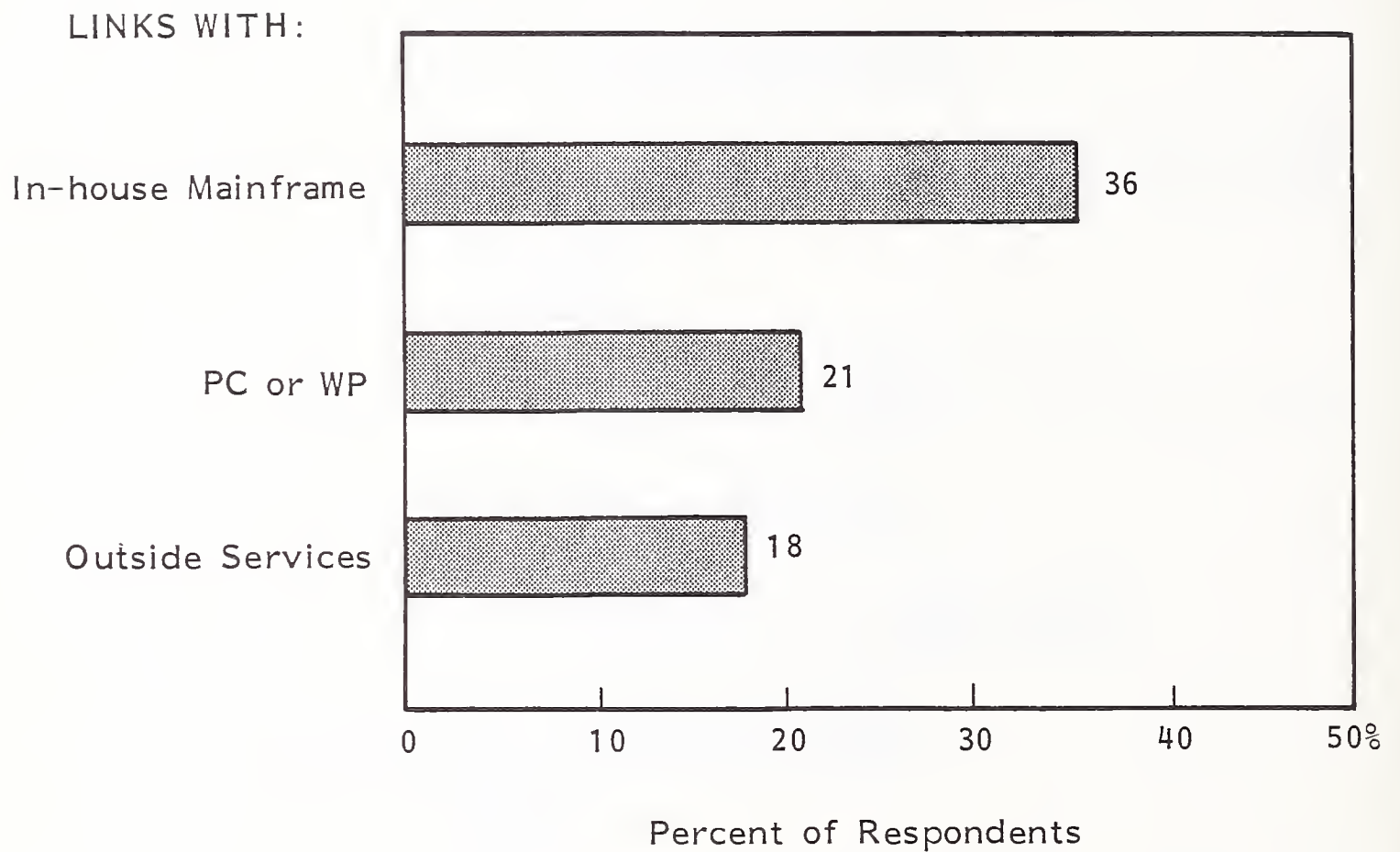
Compound annual growth rate, 1983-1986: 42%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-80

CURRENT PC COMMUNICATION
IN THE BANKING AND FINANCE SECTOR



Percent of PCs linked with other systems: 6%

SOURCE: INPUT Survey

J. INSURANCE INDUSTRY SECTOR

I. INDUSTRY OVERVIEW

a. Property/Casualty Issues

- Business conditions are not favorable for many, perhaps most, property/management companies.
 - Competition has been considerable for several years and intense price competition has led to severe underwriting losses for many companies. Until recently, the high interest rates earned on premiums not yet paid out had kept companies profitable; fallen interest rates have, therefore, hit companies hard.
 - In the past this competition leading to losses was part of the "underwriting cycle"; as losses mounted, companies would become more selective in the risks underwritten and rates would firm up.
 - However, these are not normal times for property/casualty (P&C) insurers.
 - Increasing numbers of corporations are self-insuring or setting up captive insurers.
 - Overcapacity is worldwide and increasing. (This means that the financial ability to write insurance is there, but there are insufficient customers.)
- These forces have combined to create a low growth in the amount of business being written. In 1982 there was less than a 5% increase in premiums written and there is little reason to believe that there will be appreciable growth in the near future.

- The "direct writer" companies (e.g., Allstate, State Farm), who have their own agents (as opposed to using independent agents), have continued their seemingly inexorable one-percentage-point-a-year capture of market shares in personal lines business.
- All of these issues and problems will be addressed, to varying degrees, by increased or improved automation.
 - There is a limit, of course, to the contribution that any data processing system can do to reducing cost or improving administrative efficiency, since total administrative costs are generally only about 10% of premiums.
 - Improved data offers the opportunity to add considerably to both improved marketing and underwriting (i.e., setting rates and selecting risks).
- Offering these newer kinds of solutions will require a higher level of knowledge of insurance needs and of how data processing is incorporated into insurance activities.

b. Life/Health Issues

- The general issues of increased competition and change are similar to those facing P&C companies. However, here the pressures come from different sources and consequently have somewhat different effects on information services vendors.
 - Life companies have been unable to tolerate the losses on their group insurance business.

- Competition is increasingly coming from outside the bounds of the traditional life insurance industry.
- The life companies are affected by this "invasion" in several ways.
 - Life companies have begun to compete by offering interest-based investment vehicles through so-called Universal Life policies (which, essentially, combine a mutual fund and term insurance).
 - Banking institutions (Citicorp, First Interstate) have begun to directly enter the insurance field via the friendly South Dakota legal environment.
- The life/health sector also faces several government actions that could have significant short-term and, perhaps, long-term effects.
 - The outlawing of gender-based rate making or benefits now appears a certainty. However, the prohibition is almost certain not to be applied retroactively, but only to new business.
 - There is sentiment in Congress to reduce many of the tax breaks that the industry now enjoys. Any decision will await the results of a GAO study, but the large national budget deficit alone will make this particular golden goose very attractive to Congress. Insurance companies, having to then raise prices during a time of new external competition, will be under great pressure to manage their operations and marketing more effectively.
 - The recent design to reimburse most Medicare claims on a flat-rate, per-diagnosis basis presents the group health insurance industry (both commercial companies and Blue Cross) with a two-edged sword.

- Finally, there are increasingly strong calls to tax employee fringe benefits, of which health insurance is usually the largest. If this taxation were to occur, the biggest incentive for group insurance would be reduced.
- As in the property/casualty area, many aspects of these problems and opportunities are addressable by automation.
 - Increasingly flexible systems will be needed just to handle insurance-related activities.
 - The offering of new financial products that are only tangentially related to insurance certainly offers the most opportunities to vendors.

c. Agency Issues

- The insurance industry is heading in at least two directions in its dealings with agents.
 - On the P&C side, the direct-writers' success can be traced in large part to the effectiveness of distribution systems.
 - Life companies (most of whom handle their agents in a way that is analogous to the way that direct-writer P&Cs handle their agents) are making opposite complaints: too much centralized processing.
- The agent network is already under attack from:
 - Benefits consultants (for group business).
 - Other financial institutions (e.g., Universal Life competitors).

- For the following reasons, it would not be surprising to see agent networks contract appreciably in the next decade.
 - In the case of P&C agents, mergers and agency dissolutions will result in fewer, larger agencies.
 - In the life business, there will be somewhat fewer agent slots and, to fill them, agents that are much more experienced. It will be impossible to compete with relatively well-trained bank/brokerage salespeople unless life agents retain (and are capable of retaining) their positions for much longer periods of time.
- Independent P&C agents are especially handicapped by their expensive, low-quality communications with the insurance companies they do business with. The Insurance Value Added Network (IVAN) project is critical to the overcoming of this handicap.
- What the agent needs is improved communications in the larger sense.
 - Outside vendors are ideally positioned to allow agents to communicate with multiple companies. The vendor must, of course, have in-depth insurance knowledge.
 - In the P&C area communications is the focus of the IVAN project. As this project takes hold there should be many ancillary opportunities that are outside the scope of IVANS or that IBM is unable to fulfill.

2. BUDGET ANALYSIS

- In the insurance sector 72% of the companies expect information systems budgets to rise in 1984 and 19% expect no change. Nine percent anticipate reductions. The average expectation for budget growth is 8%. While this is close to the 7% average for all industries, it is a very significant drop from 1983's 15% insurance sector growth.

- The information systems budget as a percent of total insurance company revenue is .8% - very near the .9% average for all industries.
- Exhibit IV-81 shows the distribution of expenses in insurance sector information systems budgets. This breakdown varies little from the average for all industries.
 - The largest nonpersonnel budget items are communications and mainframes.
 - Insurance firms spend somewhat more than other companies on software maintenance (see Exhibit III-9).
 - Less than half the normal expenditures are made for minicomputers.
- The largest increase in spending projected for 1984 is for outside processing services, which should climb almost 60%.
 - Microcomputer spending will also grow about 60%, but starts from a smaller base.
 - Mainframe expenditures will stagnate.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Insurance executives place a very high emphasis on cost problems, just as executives in most other industries do. But executives also rate hardware and telecommunications relatively high, as can be seen in Exhibit IV-82.

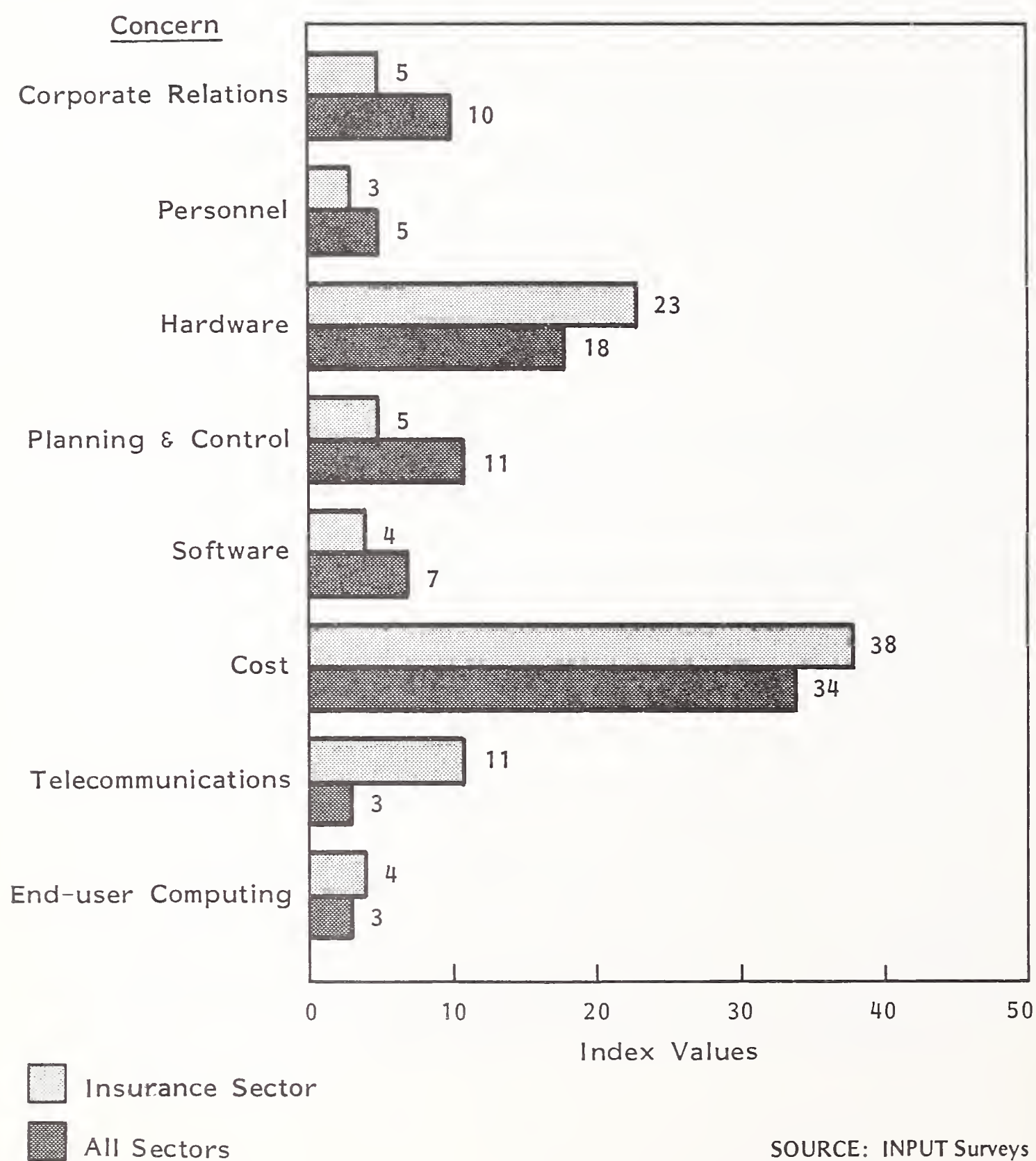
EXHIBIT IV-81

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES IN THE INSURANCE SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	46.9%	5.5%
Mainframe Processors	7.7	0.2
Minicomputers	2.1	3.3
Micro-personal Computers	2.5	61.5
Terminals	3.7	4.8
Peripherals	6.6	6.1
Total Hardware	22.6%	3.6%
Communications	9.9	5.4
External Software	4.4	6.4
Custom Programming	3.1	10.0
Integrated Systems	0.0	0.0
Total Software	7.5%	6.3%
Software Maintenance	3.0	1.1
Hardware Maintenance	3.4	1.4
Total Maintenance	6.4%	1.3%
Outside Processing Services	3.8	57.7
Other	2.9	5.9
Total	100.0%	8.4%

EXHIBIT IV-82

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE INSURANCE SECTOR



- On the other hand, executives express a particularly low regard for planning and control, and software concerns.

b. Problems

- Insurance information systems executives rate planning and control as their biggest concern, as shown in Exhibit IV-83. Indeed, they rate it higher than do executives of any other sector. Backlog problems in particular are seen as very troubling.
- This concern among IS managers about planning and control issues is in marked contrast to the concerns of senior management who consider these issues to be of only minor import. One reason is that senior executives are not directly responsible for backlog complaints.
- Information systems managers are also very concerned about personnel issues, especially training, and with improving corporate relations.
- Relatively low interest, however, is expressed in software, telecommunications, and end-user problems. The low rating given to telecommunications reflects a view that is out of synch with that of senior executives, who appear to be much more concerned.
- Exhibit IV-84 lists the planning issue subgroups that insurance IS managers perceive as being their top problems.

c. Objectives

- While all sectors rated software objectives very high, none rated it higher than insurance, as shown in Exhibit IV-85. Cost objectives were also rated relatively high. Software applications objectives in particular are considered to be important.

EXHIBIT IV-83

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS IN THE INSURANCE SECTOR

(IMPORTANCE TO I.S. MANAGERS)

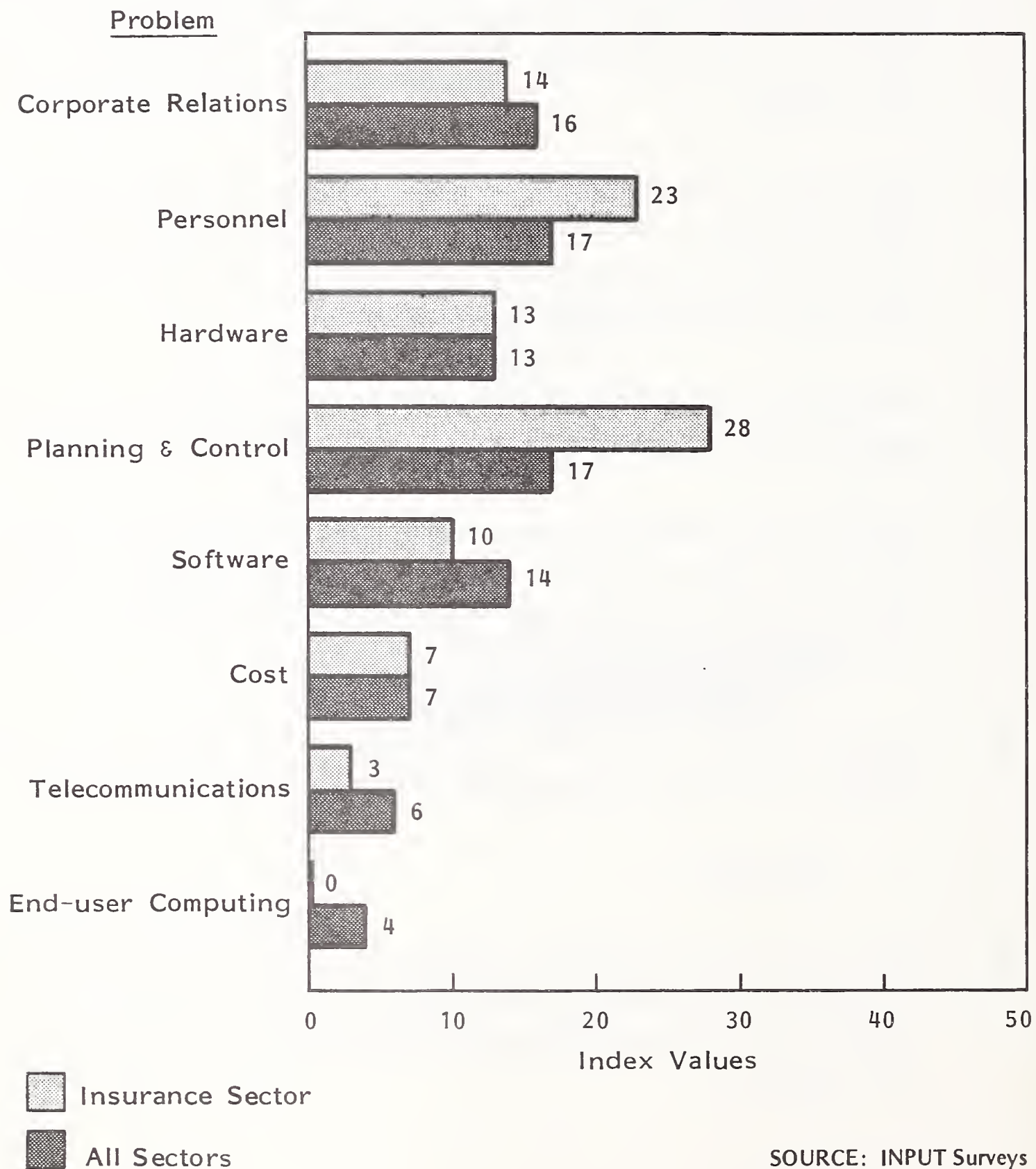


EXHIBIT IV-84

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
INSURANCE INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

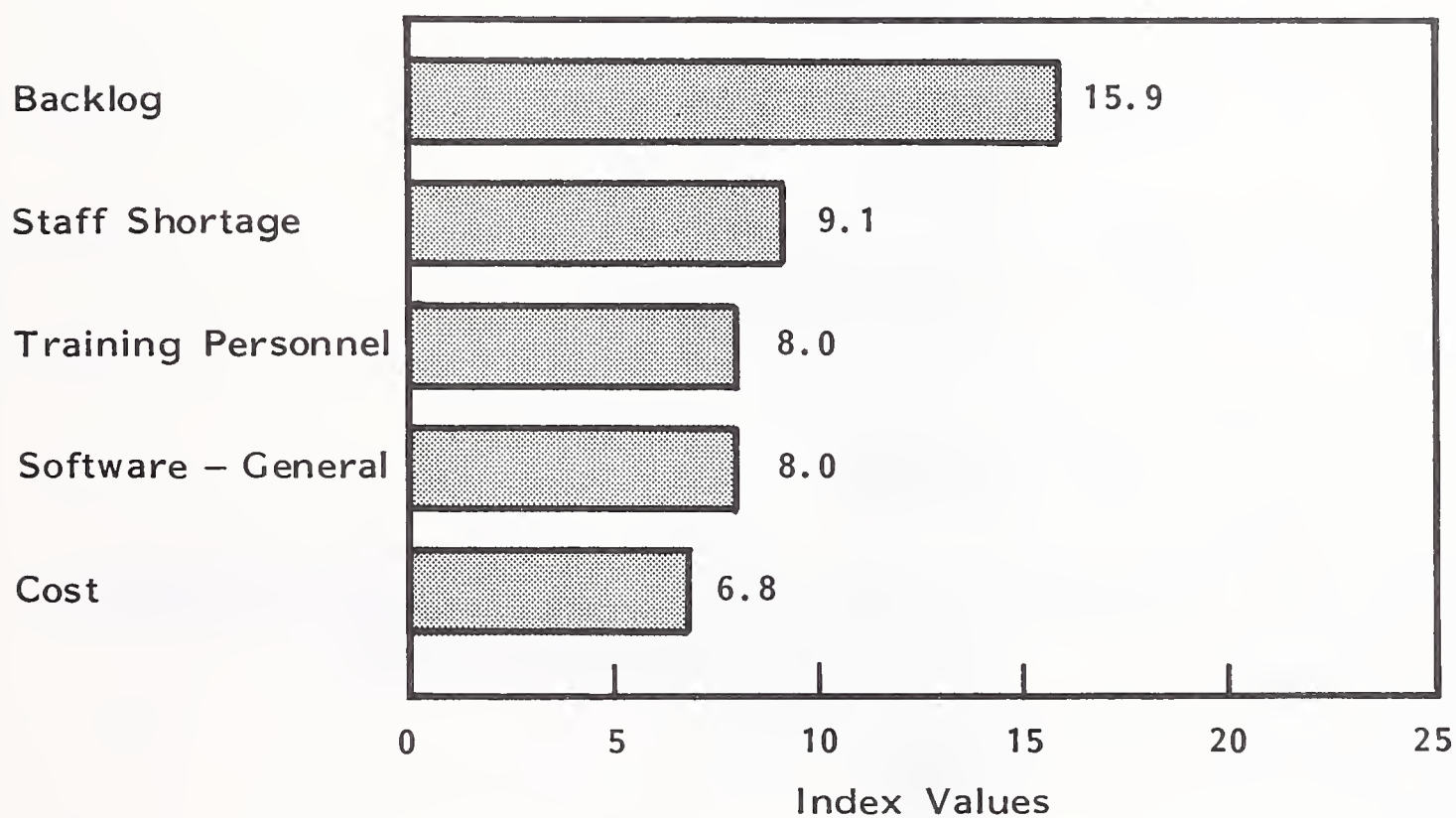
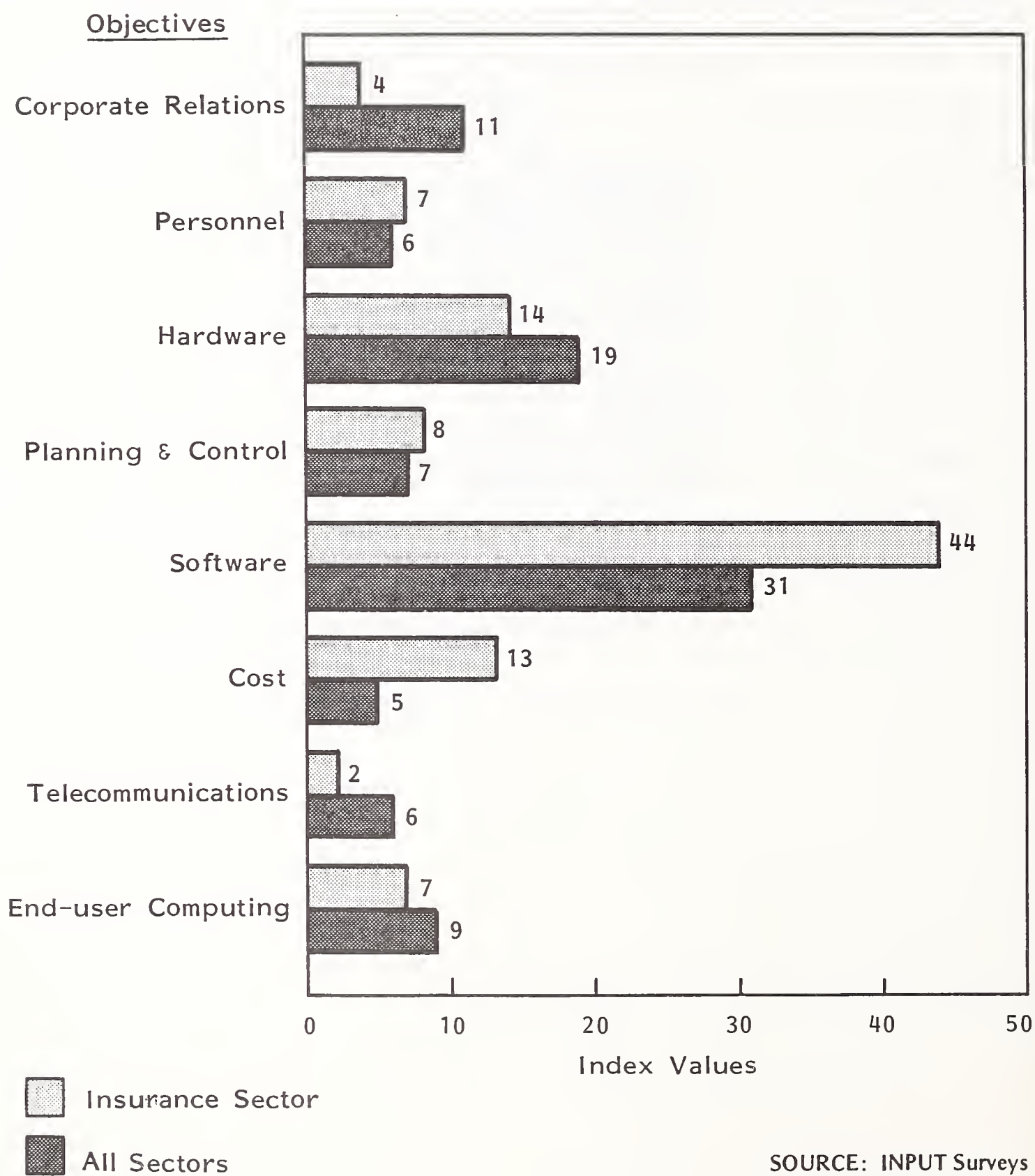


EXHIBIT IV-85

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES
IN THE INSURANCE SECTOR

(IMPORTANCE TO I.S. MANAGERS)



- The strength of the emphasis on software objectives is particularly interesting in light of the low rating given to software problems by both information systems managers and senior executives.
- Hardware upgrade and workload objectives are two other specific areas receiving special attention.
- Cost objectives were rated relatively high, reflecting senior management concerns.
- Corporate relations and telecommunications objectives were rated relatively low.
- Exhibit IV-86 enumerates the planning issue subgroups that insurance IS managers rate as most important objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the insurance industry are shown in Exhibit IV-87. Thirty-two percent of the respondents said that they will be developing cross-industry applications, while the remaining 68% said they will be developing industry-specific applications.
- Most respondents in the insurance industry plan to develop claims processing applications. Also being considered next year are agent accounting, health care, and life insurance applications. Other insurance industry applications include on-line policy files and agency information systems.
- One cross-industry application widely planned in the insurance industry is sales analysis.

EXHIBIT IV-86

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
INSURANCE INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

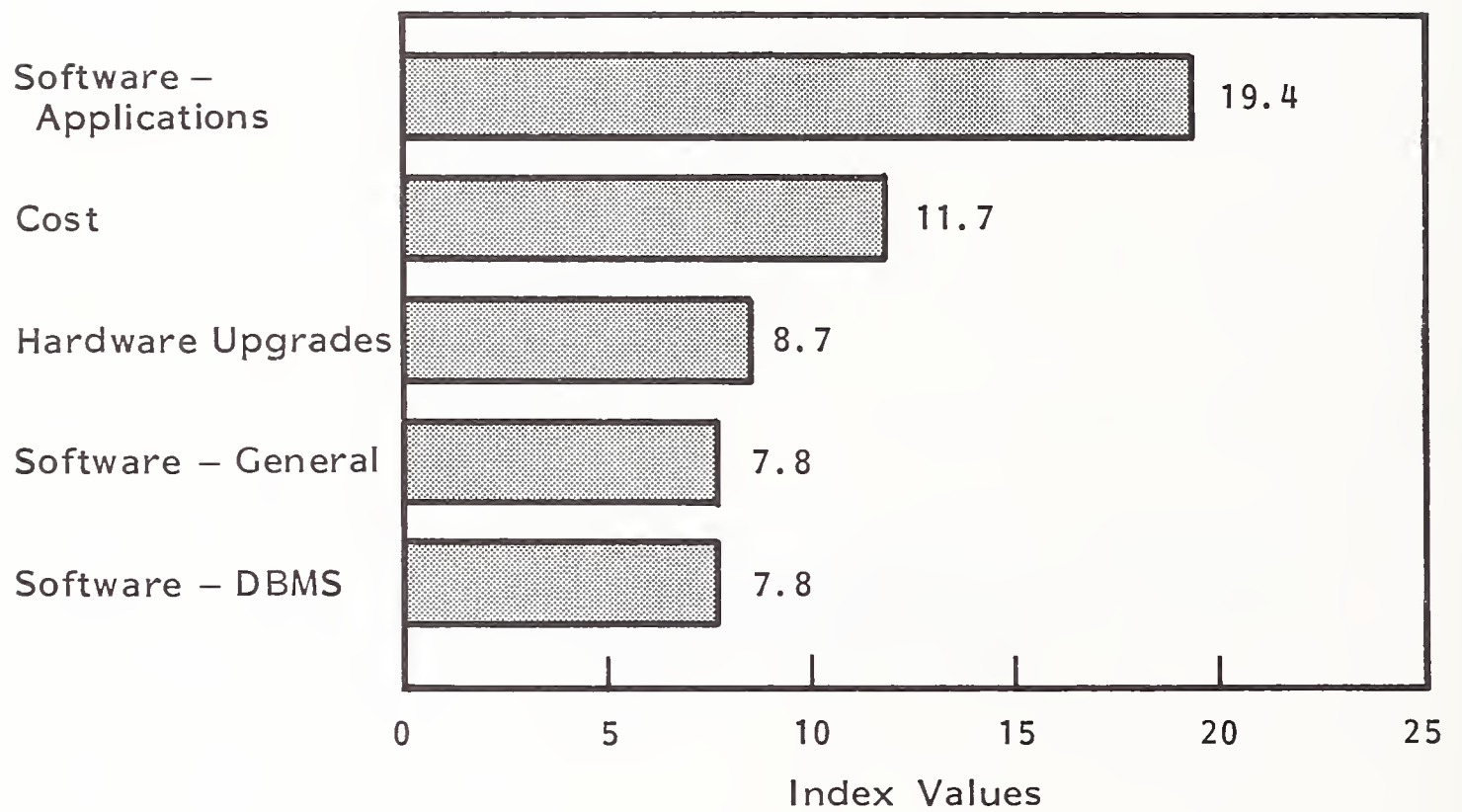
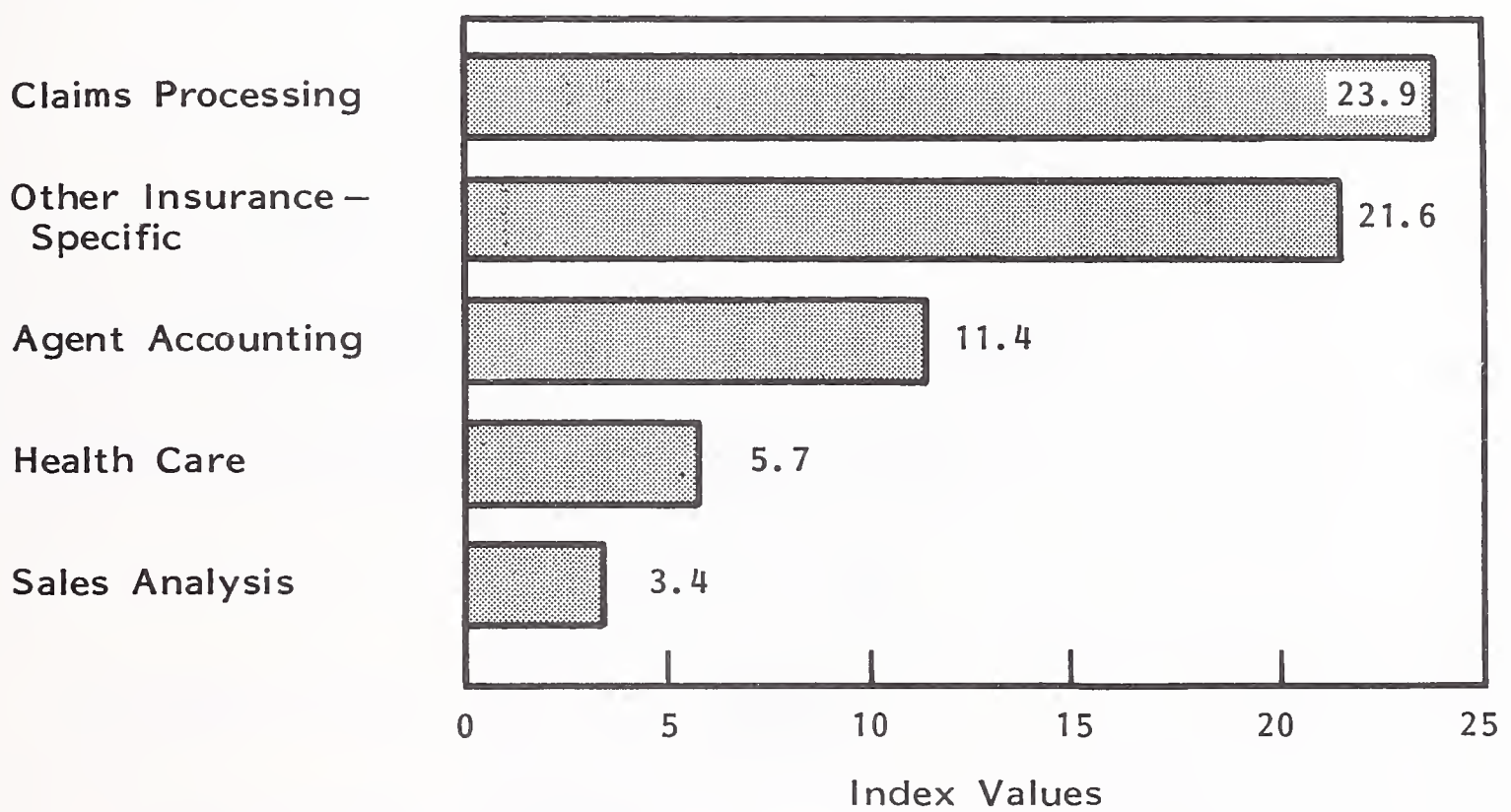


EXHIBIT IV-87

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE INSURANCE INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



- The most significant events affecting applications development within the companies interviewed were software upgrades.
- Information systems managers in the insurance industry reduce the time and costs associated with program development by:
 - Using fourth-generation languages and application development tools.
 - Purchasing applications software packages rather than developing applications in-house.
 - Providing training for their staff.
- The most significant event affecting applications development within the insurance industry was the evolution of value-added networks that allow agencies to communicate with one another. Personal computers also affected applications development in the process manufacturing industry. Health care cost containment and new government regulations were also bugs in applications development.

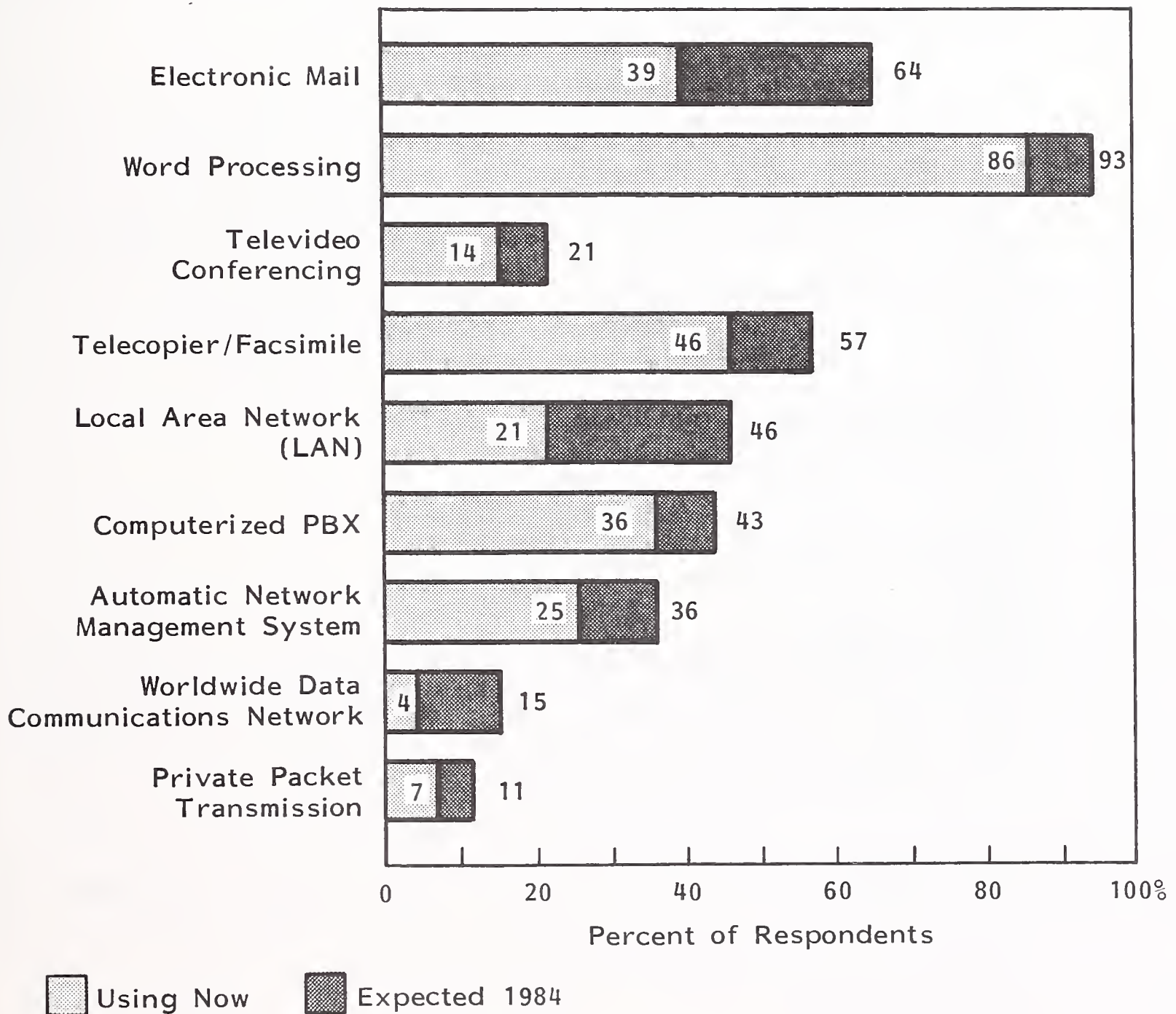
5. END-USER COMPUTING

a. Office Systems

- Electronic mail and local-area networks are the fastest growing office systems applications in the insurance industry, with a quarter of our respondents intending to be installing them by the end of 1984, as can be seen in Exhibit IV-88. In addition, about two-fifths already have electronic mail systems and a fifth have LANs.
- Word processors are already pervasive. Telecopiers and facsimile devices and PBXs are also relatively common.

EXHIBIT IV-88

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE INSURANCE INDUSTRY



- Televideo conferencing is seldom used, though this sector uses it more than most (see Exhibit III-27).

b. Personal Computers

- Over eight-tenths of our respondents in the insurance sector report personal computers in their organizations. On average, there are 27 PCs in each organizational entity; by 1986, there will be 620, reflecting a compound annual growth rate of 185%, as shown in Exhibit IV-89.
- About five percent of the personal computers in this sector communicate with other devices. Three-tenths of our respondents report some links with in-house computers, over a tenth report links with other personal computers or word processors, and a sixth have PCs communicating with outside services, as shown in Exhibit IV-90.

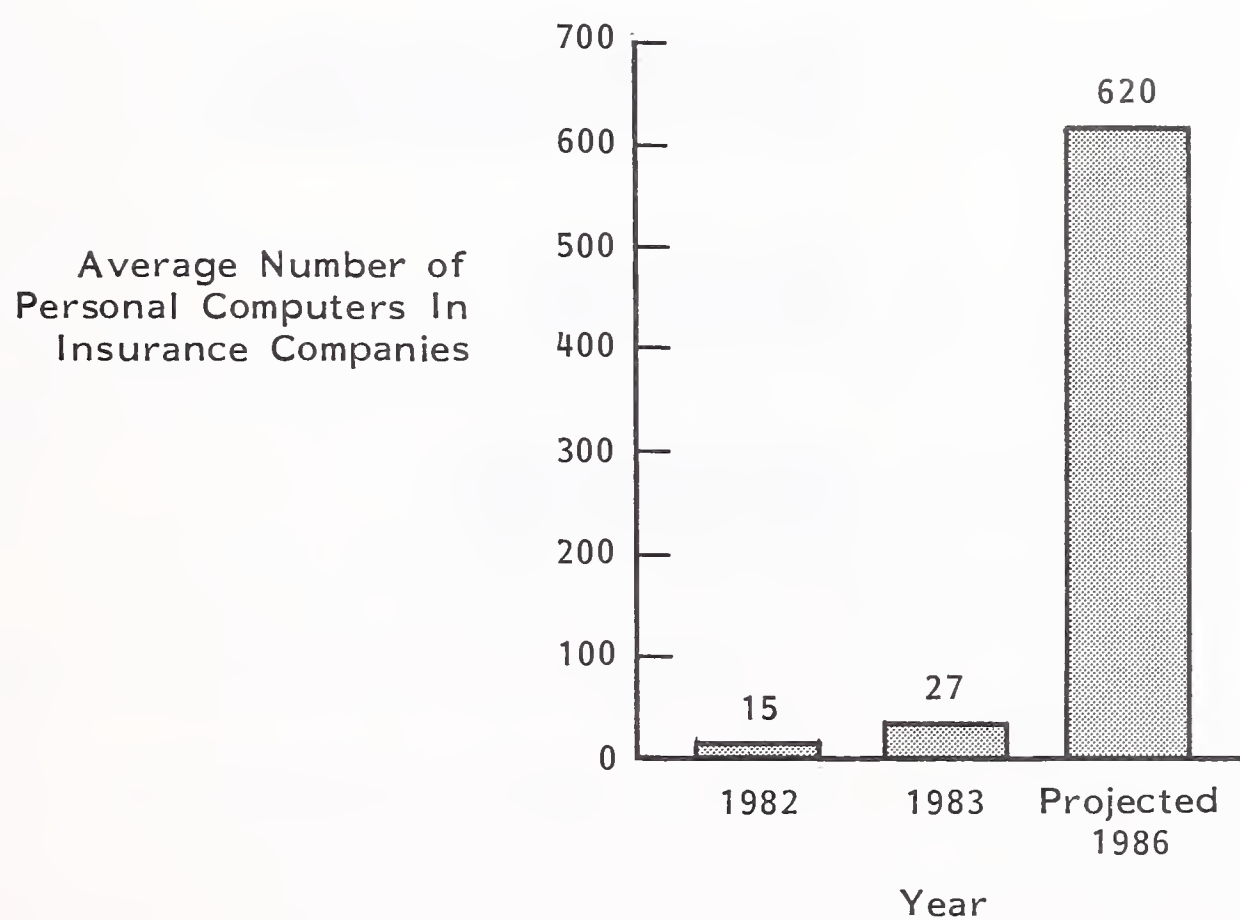
K. GOVERNMENT SECTOR

I. INDUSTRY OVERVIEW

- The federal government, the largest computer user in the world, added almost \$270 million worth of mainframes and peripherals to its inventory during fiscal 1982. Like most other sectors, it is increasing the share of personal computers and minicomputers in its CPU mix.
- Many agencies of the government are coping with very old systems; the computer systems at the Social Security Administration, Federal Aviation Administration, and Internal Revenue Service systems are causing problems - and being updated.

EXHIBIT IV-89

NUMBER OF PERSONAL COMPUTERS IN
INSURANCE SECTOR COMPANIES



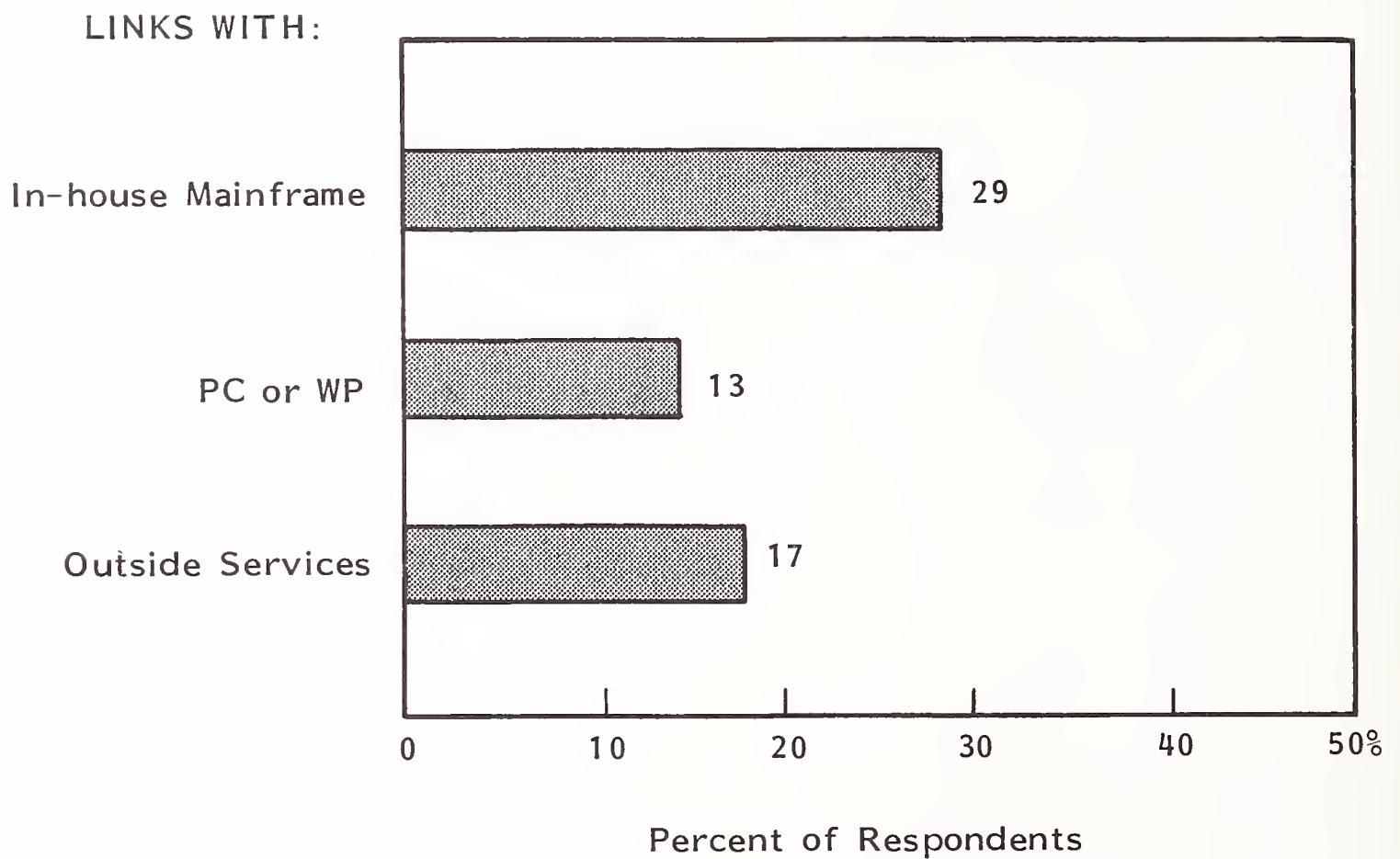
Compound annual growth rate, 1983-1986: 185%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-90

CURRENT PC COMMUNICATION
IN THE INSURANCE SECTOR



Percent of PCs linked with other systems: 5%

SOURCE: INPUT Survey

- In addition to obsolete and malfunctioning equipment, government IS managers are having especially acute problems trying to find qualified personnel, especially for management positions and programming. The widespread IS illiteracy of non-IS managers has been a major stumbling block to implementations.
- The high cost of software - particularly the customized software so often needed for nonstandard government applications - has further slowed the adoption of information services in this sector.
- Tight budgets in both the federal and state governments are changing the importance of price considerations in IS budgets. However, military procurement contracts remain quite healthy.

2. BUDGET ANALYSIS

- All organizations within the government sector expect increases in spending in 1984.
 - The average expectation for budget growth is 9% - just slightly above the 7% average for all sectors, but the same as 1983 growth.
- The information systems budget as a percent of total government sector revenue is 1.5% - significantly above the .9% average for all industries.
- Exhibit IV-91 shows the distribution of expenses in government sector information systems budgets. This breakdown differs significantly from the industry average.
 - Spending on mainframe processors and hardware maintenance is much higher here than it is in other sectors.

EXHIBIT IV-91

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE GOVERNMENT SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	43.8%	6.2%
Mainframe Processors	13.5	6.4
Minicomputers	4.9	11.8
Micro-personal Computers	3.9	23.3
Terminals	4.2	14.2
Peripherals	7.1	12.6
Total Hardware	33.6%	10.0%
Communications	8.3	12.0
External Software	1.0	11.2
Custom Programming	0.1	22.2
Integrated Systems	0.0	0.0
Total Software	1.2%	2.7%
Software Maintenance	0.9	7.0
Hardware Maintenance	6.4	(1.1)
Total Maintenance	7.3%	(0.1%)
Outside Processing Services	1.6	13.4
Other	4.4	2.9
Total	100.0%	9.0%

- Only about one-sixth as much money is spent on software, and outside processing services spending is one-half the average for all sectors (Exhibit III-9).
- The largest increases in spending in relative terms projected for 1984 are for microcomputers and custom programming. In absolute forms, all hardware and communication spending will increase significantly.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- Government administrators, just as managers in other sectors, consider cost issues important, they express equal regard for hardware concerns, and planning and control issues, as can be seen in Exhibit IV-92.
- Personnel issues are also rated high.

b. Problems

- Information systems managers in the government sector rate corporate relations and personnel issues especially high, as shown in Exhibit IV-93.
- Software quality also stands out as an unusually important concern in this sector.
- In contrast to senior management concerns, information systems managers do not consider cost, or planning and control to be particularly pressing problems.
- Exhibit IV-94 lists planning issue subgroups that government IS managers rank as most important problems
- Staff shortages are rated unusually high as a problem.

EXHIBIT IV-92

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS
IN THE GOVERNMENT SECTOR

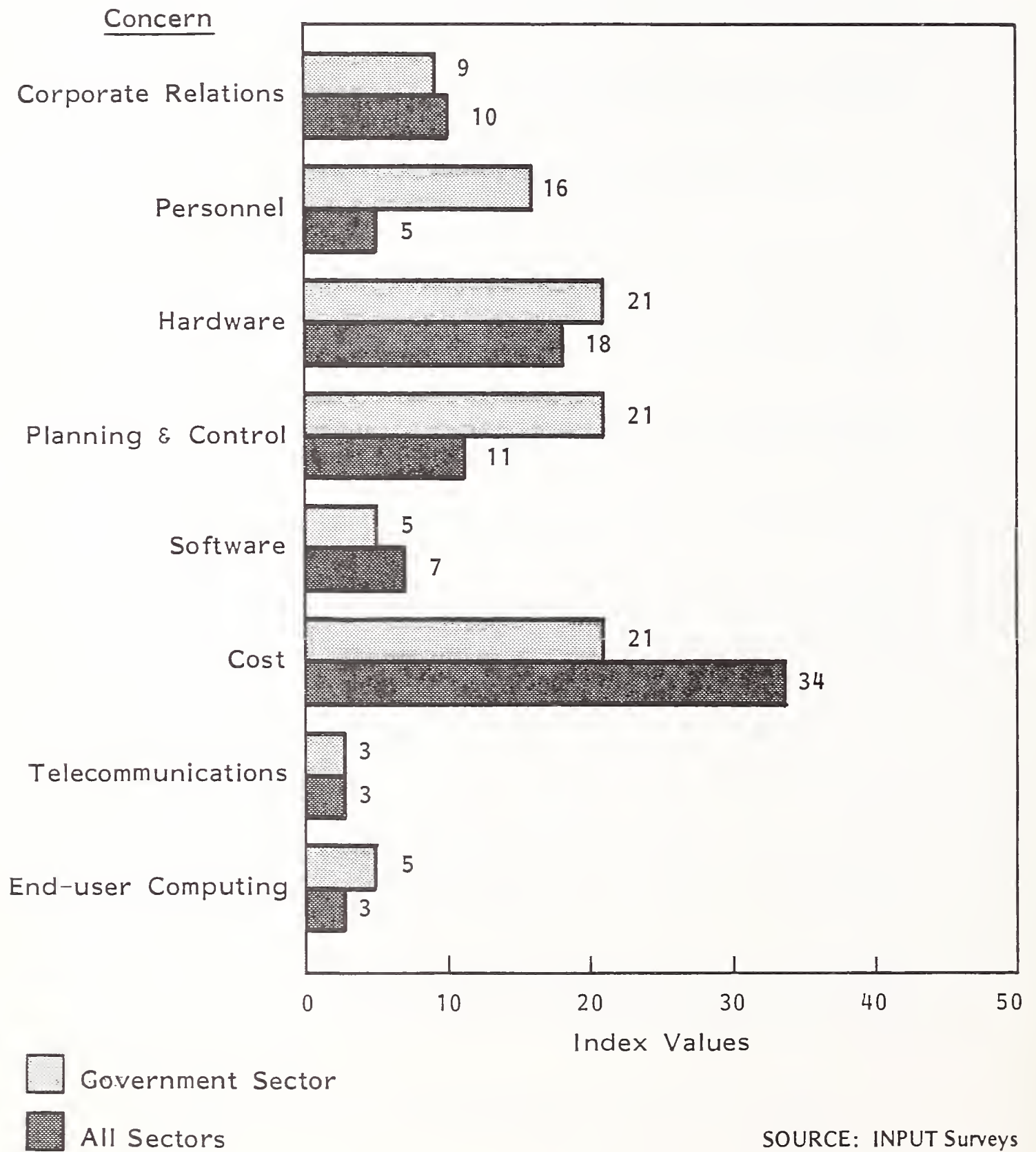


EXHIBIT IV-93

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE GOVERNMENT SECTOR
(IMPORTANCE TO I.S. MANAGERS)

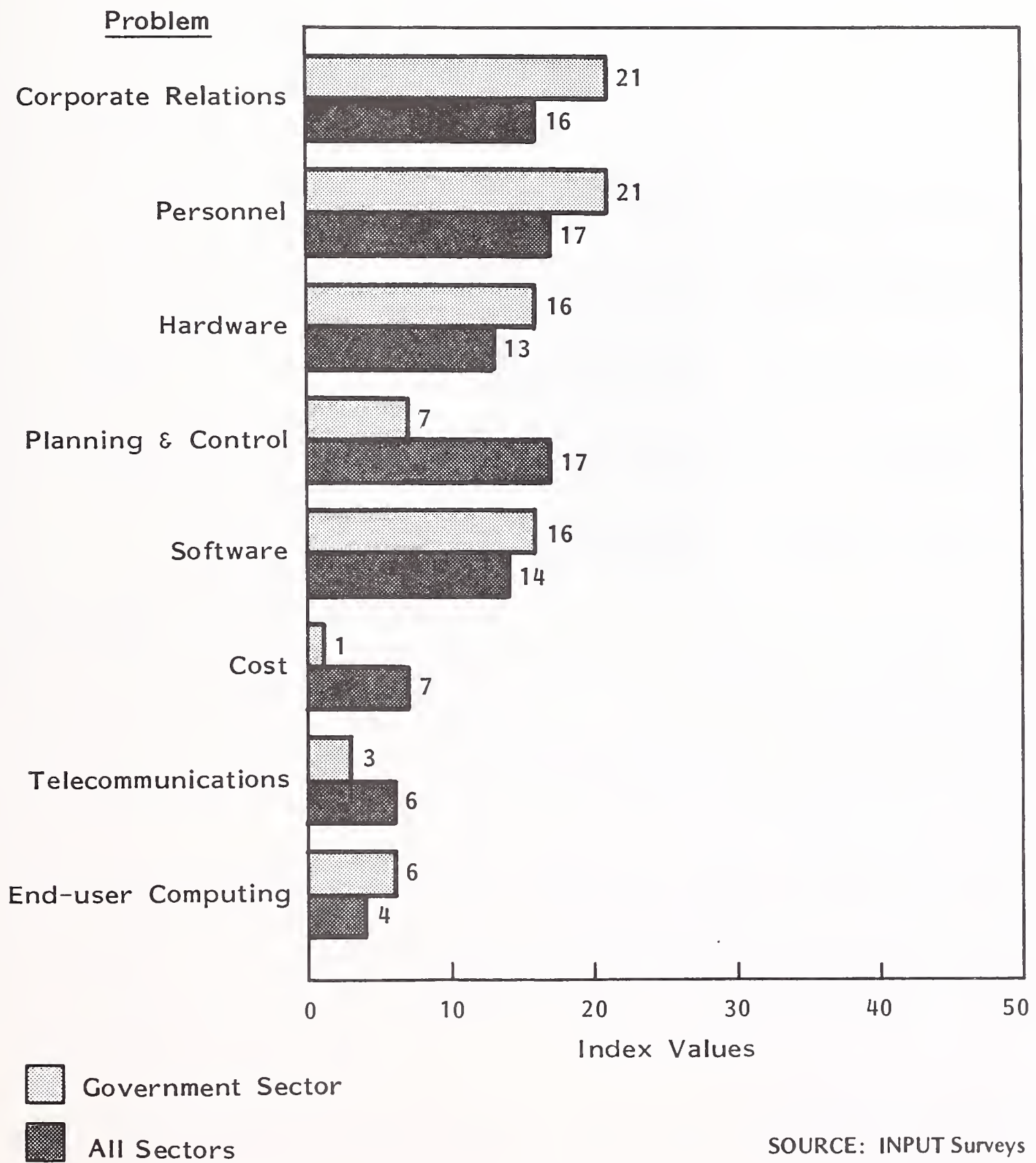
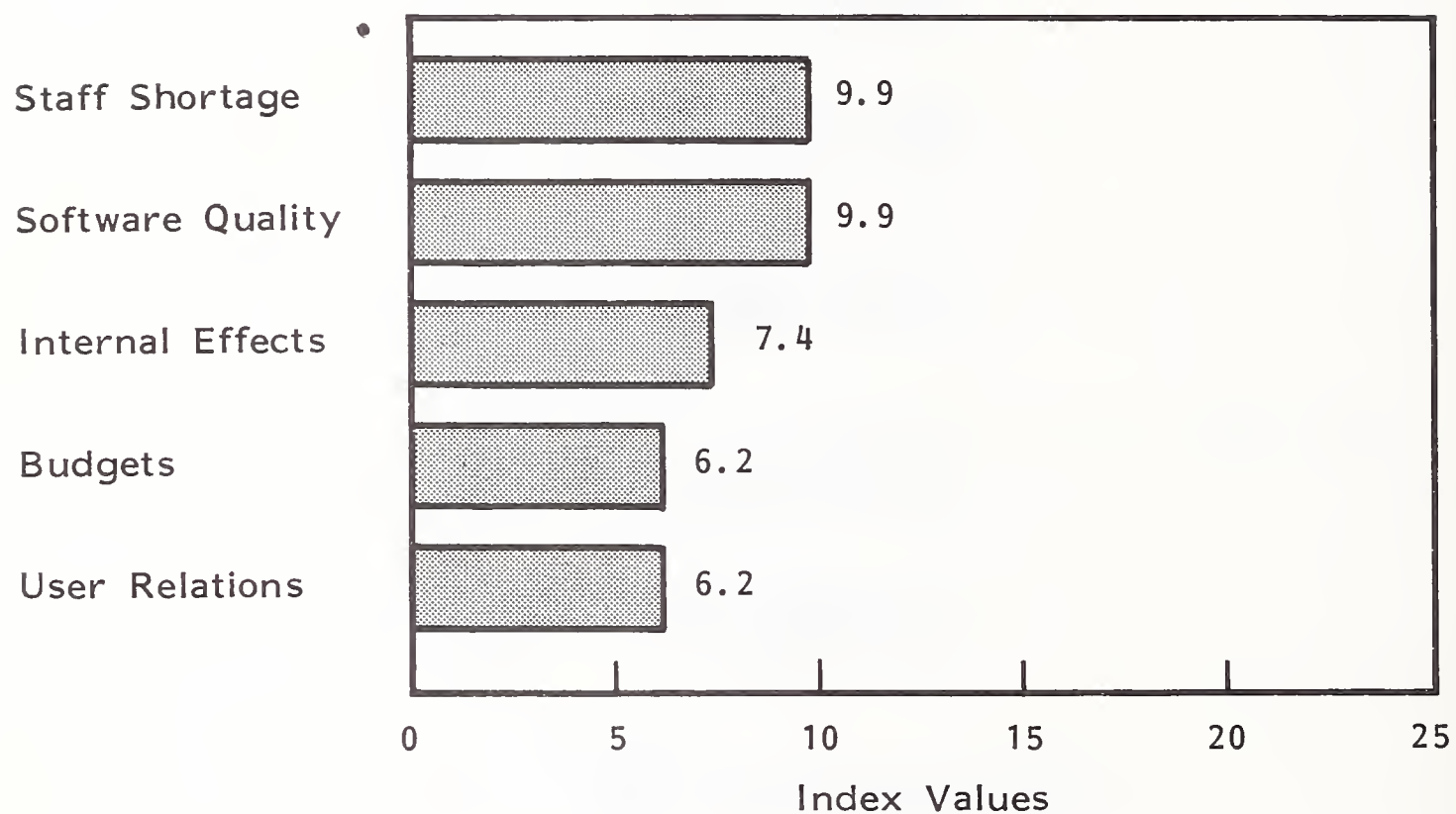


EXHIBIT IV-94

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
GOVERNMENT
(IMPORTANCE TO I.S. MANAGERS)



c. Objectives

- The government sector is one of the very few sectors that rates hardware objectives above software, as shown in Exhibit IV-95. Indeed, hardware is rated higher in this sector than it is in any other. In particular, hardware upgrade objectives are considered extremely important.
- Telecommunications (especially networks) and end-user objectives also rate relatively high.
- Cost and corporate relations objectives are considered to be less important. The low rating given to corporate relations objectives is particularly interesting in view of the fact that corporate relations problems were rated quite high.
- Exhibit IV-96 enumerates planning issue subgroups that government IS managers rate as the most important objectives.

4. APPLICATIONS

- The top five information systems applications planned by managers in the government are shown in Exhibit IV-97. Forty-one percent of the respondents said that they will be developing cross-industry applications, while the remaining 59% said they will be developing industry-specific applications.
- Information systems managers in government plan to develop tax processing applications this coming year. Also being considered for 1984 are inventory control and corporate licensing applications. Other government-specific applications include motor vehicle licensing systems and inspection systems for handling permits.
- Some respondents said they expect to develop payroll applications next year.

EXHIBIT IV-95

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES
IN THE GOVERNMENT SECTOR
(IMPORTANCE TO I.S. MANAGERS)

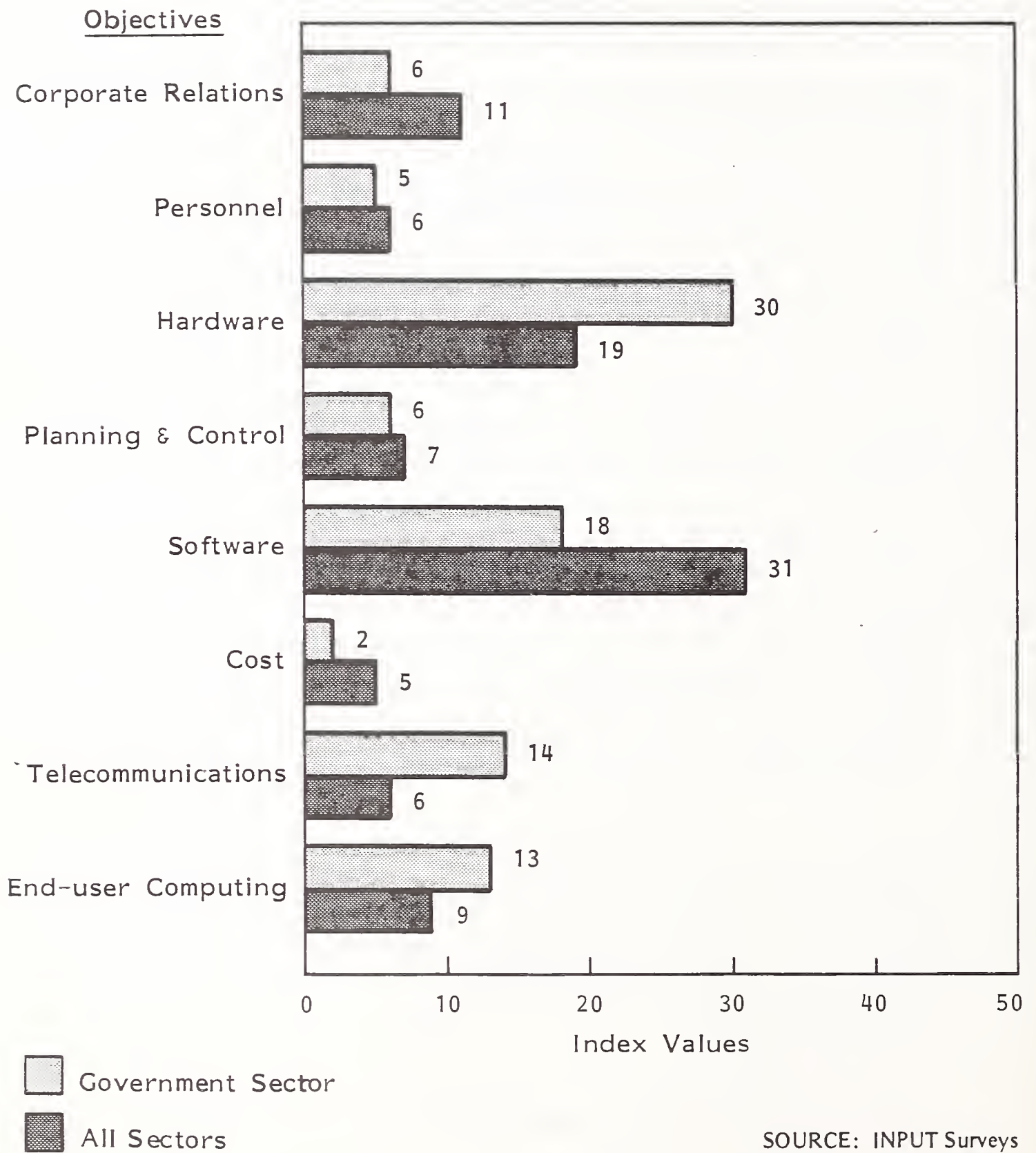


EXHIBIT IV-96

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
GOVERNMENT
(IMPORTANCE TO I.S. MANAGERS)

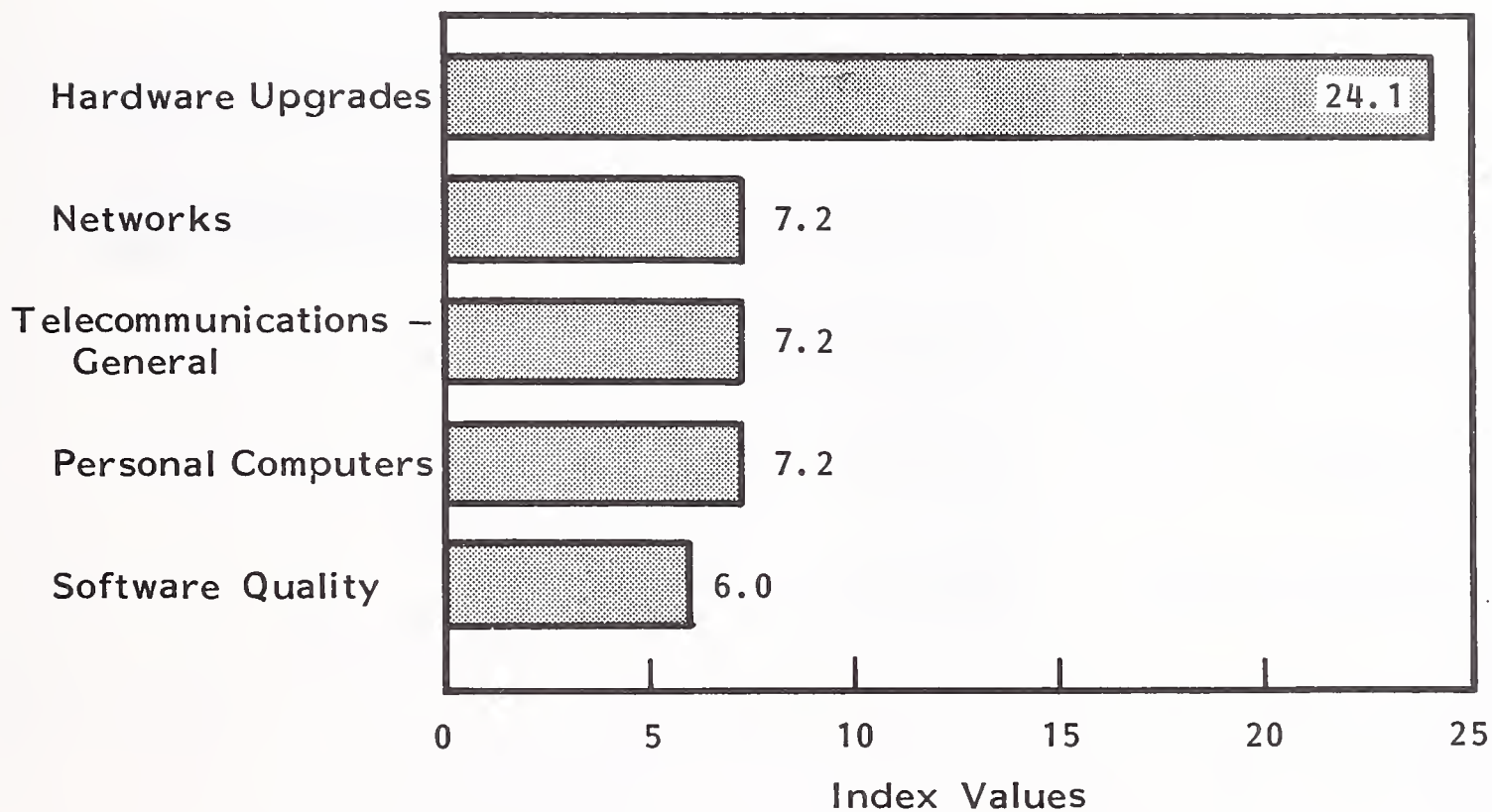
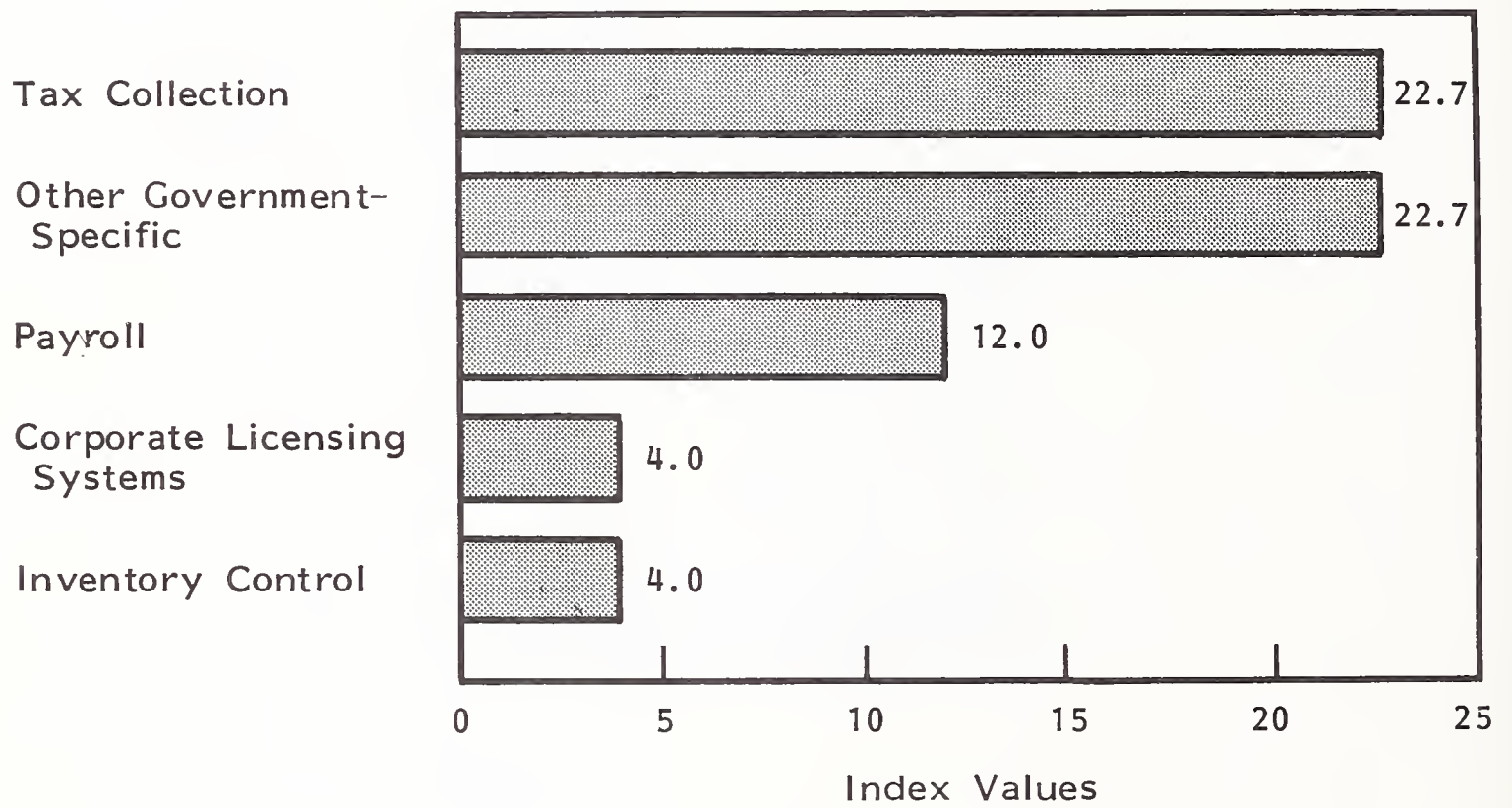


EXHIBIT IV-97

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE GOVERNMENT
(IMPORTANCE TO I.S. MANAGERS)



- The most significant events affecting applications development within the agencies interviewing were hardware upgrades and software acquisitions.
- Information systems managers in the government reduce the time and costs associated with program development by:
 - Purchasing applications software packages rather than developing applications in-house.
 - Using application development tools.
 - Training personnel.
- The most significant event affecting applications development within the government was the legislative changes that lowered revenue.

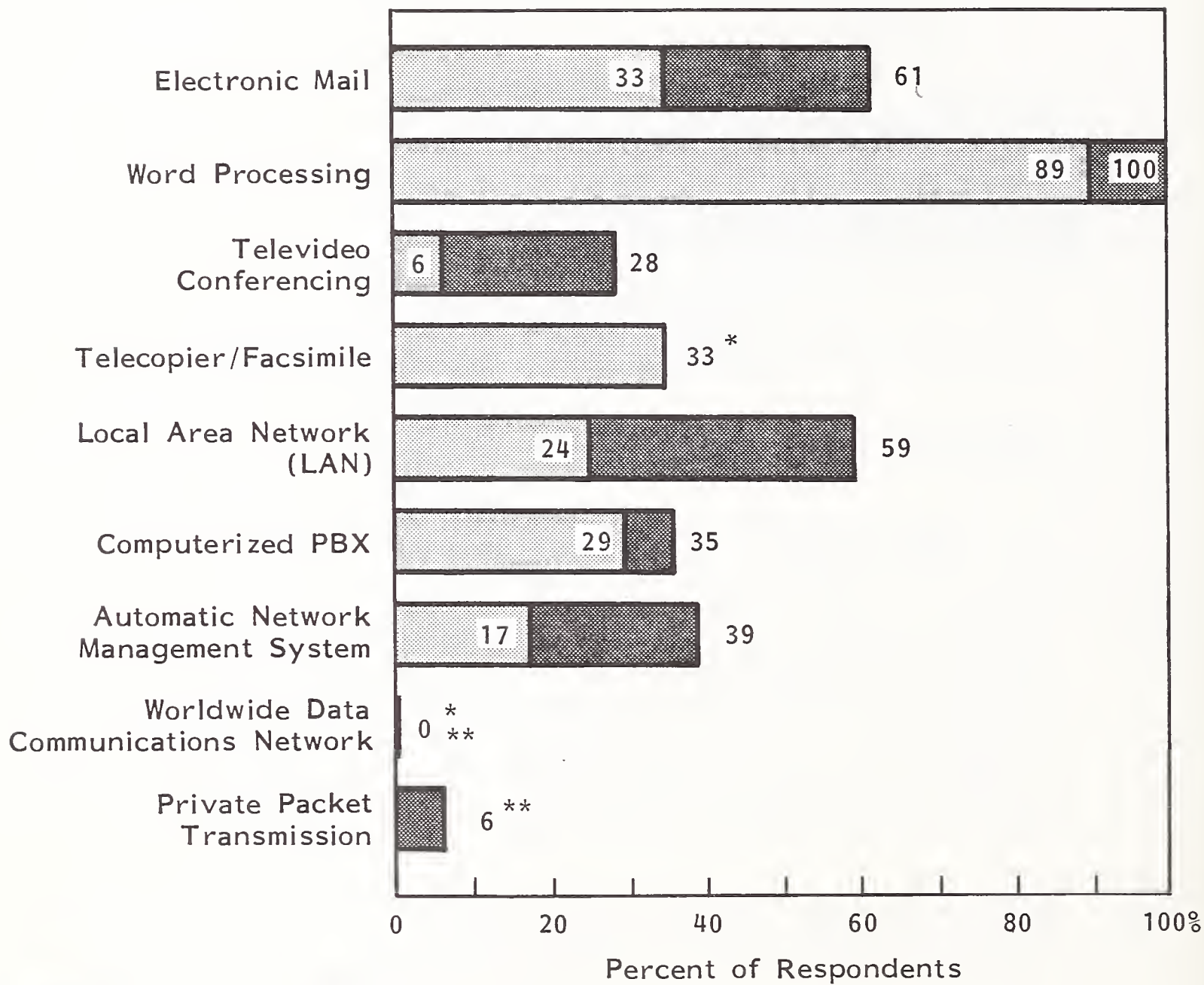
5. END-USER COMPUTING

a. Office Systems

- Local-area networks and electronic mail applications are the fastest growing office systems applications in the government sector, with about a third of our respondents reporting their intention to implement these items by the end of 1984, as can be seen in Exhibit IV-98. Electronic mail is already in use in a third of the environments, and LANs are in use at a quarter.
- The most pervasive application is word processing. Telecopiers and facsimile devices, and PBXs are in use in a third of our respondents' organizations.
- Televideo conferencing is rarely used.

EXHIBIT IV-98

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE GOVERNMENT INDUSTRY



Using Now
 Expected 1984

* No Change in 1984

** Now 0

b. Personal Computers

- Two-thirds of our respondents in the government sector report personal computers in their organizations. On average, there are 80 PCs in each organizational entity; by 1986, there will be 245, reflecting a compound annual growth rate of 45%, as shown in Exhibit IV-99.
- About 2% of all the personal computers in this sector communicate with other devices. Over one-sixth of our respondents report some links with in-house computers and two-fifths report links with other personal computers or word processors. No respondents report PC communications with outside services, as shown in Exhibit IV-100.

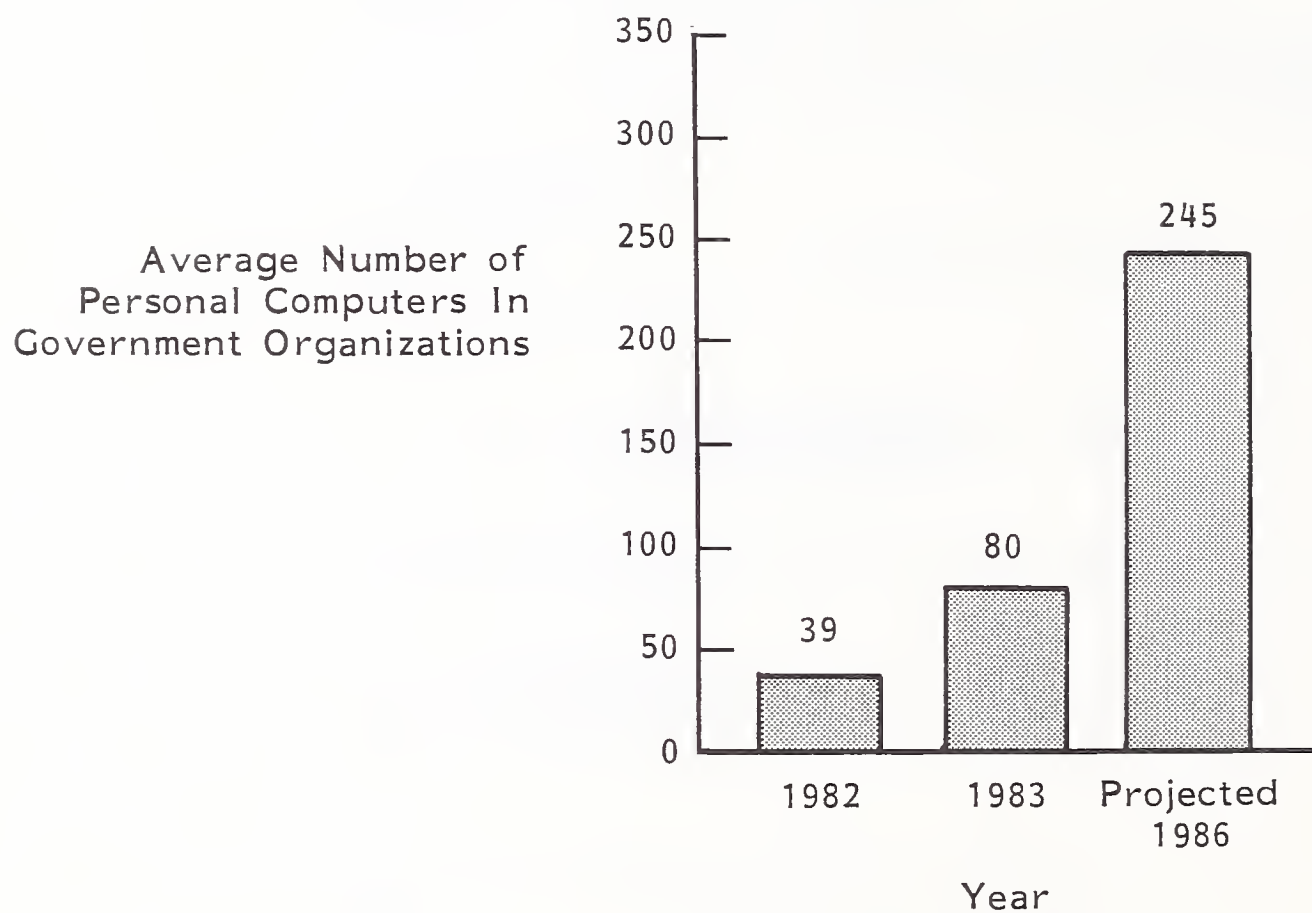
L. EDUCATION SECTOR

I. INDUSTRY OVERVIEW

- Personal computers are entering secondary schools at an accelerating rate.
 - Schools were using 274,000 desktop machines at the end of 1982, and will have nearly one million units by 1986.
 - Classroom personal computer education programs will constitute a \$45 million market in 1983.
- This infusion of personal computers has more often than not proceeded haphazardly, with little planning. It has moved forward because of the insistence of parents and the encouragement of hardware vendors. Vendors stand to gain considerably from follow-on sales to students who have been made comfortable with vendor equipment in the classroom.

EXHIBIT IV-99

NUMBER OF PERSONAL COMPUTERS IN
GOVERNMENT SECTOR ORGANIZATIONS



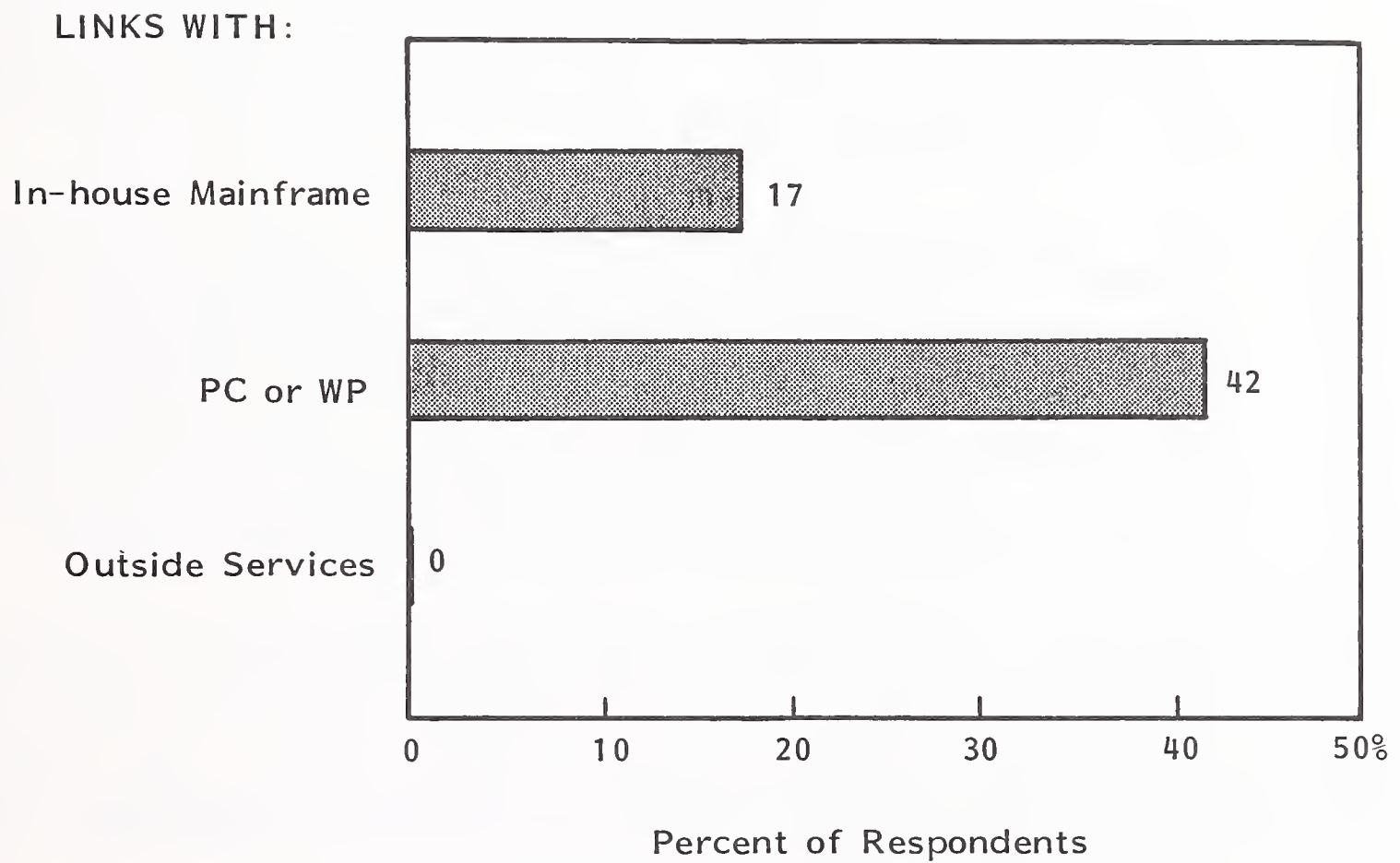
Compound annual growth rate, 1983-1986: 45%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-100

CURRENT PC COMMUNICATION
IN THE GOVERNMENT SECTOR



Percent of PCs linked with other systems: 2%

SOURCE: INPUT Survey

- Software vendors do not have similar incentives because educational courseware is specialized and there is no effective linkage between classroom use and follow-on software sales. The result has been a dearth of acceptable educational courseware, but a number of firms are working to meet the new demand; educators have reported a visible improvement in software quality in the last year.
- In the meantime, school districts are skimping on purchases of educational courseware because of budgetary squeezes. With the emphasis on purchasing equipment instead of systems - an outcome of the economics of the business - this skimping appears inevitable.
- INPUT predicts increasing sophistication in the procurement of educational computer systems by schools as more attention is paid to schools by vendors and as school administrators learn how to introduce PCs more effectively. Software will become a more important consideration and will receive more funding, but the fundamental economic structure militates against the success of integrated systems, unless coordinated with manufacturers' systems.
- Universities are also expanding their educational use of computers, again largely microcomputers. Some of the personal computers have been donated to universities, and others have been offered at discount; again, hardware vendors recognize that exposure to their products in classrooms will lead to follow-on sales to students.
- In the school administration arena, personal computers and "friendly" minis are bringing applications in-house from remote computer service vendors.
- These same vendors are also facing new competition from universities, who are selling some of their excess timesharing capacity to other schools. The universities have been aided in these new efforts by the tax laws, which give them advantages as nonprofit organizations.

2. BUDGET ANALYSIS

- In the education sector 92% of all organizations expect information systems budgets to increase in 1984 and 8% anticipate no change.
 - The average expectation for budget growth is 7% - the same as the average for all industries.
 - At 9%, 1983's budget growth is only slightly higher.
- The information systems budget as a percent of total education sector expenditures is 1.3%, considerably above the .9% average for all sectors.
- Exhibit IV-101 shows the distribution of expenses in education sector information systems budgets. This breakdown varies somewhat from the average for all sectors (see Exhibit III-9).
 - Microcomputer and maintenance spending is unusually high.
 - Relatively little is spent on minicomputers outside processing services, software, and peripherals.
- Spending on microcomputers will take the biggest leap in 1984, growing more than 35%. Mainframe and minicomputer spending will stagnate.

3. INFORMATION SYSTEMS ISSUES

a. Senior Management Concerns

- While educators join other managers in their overriding concern for cost, they also express an unusually high regard for hardware issues and end-user computing, as can be seen in Exhibit IV-102.

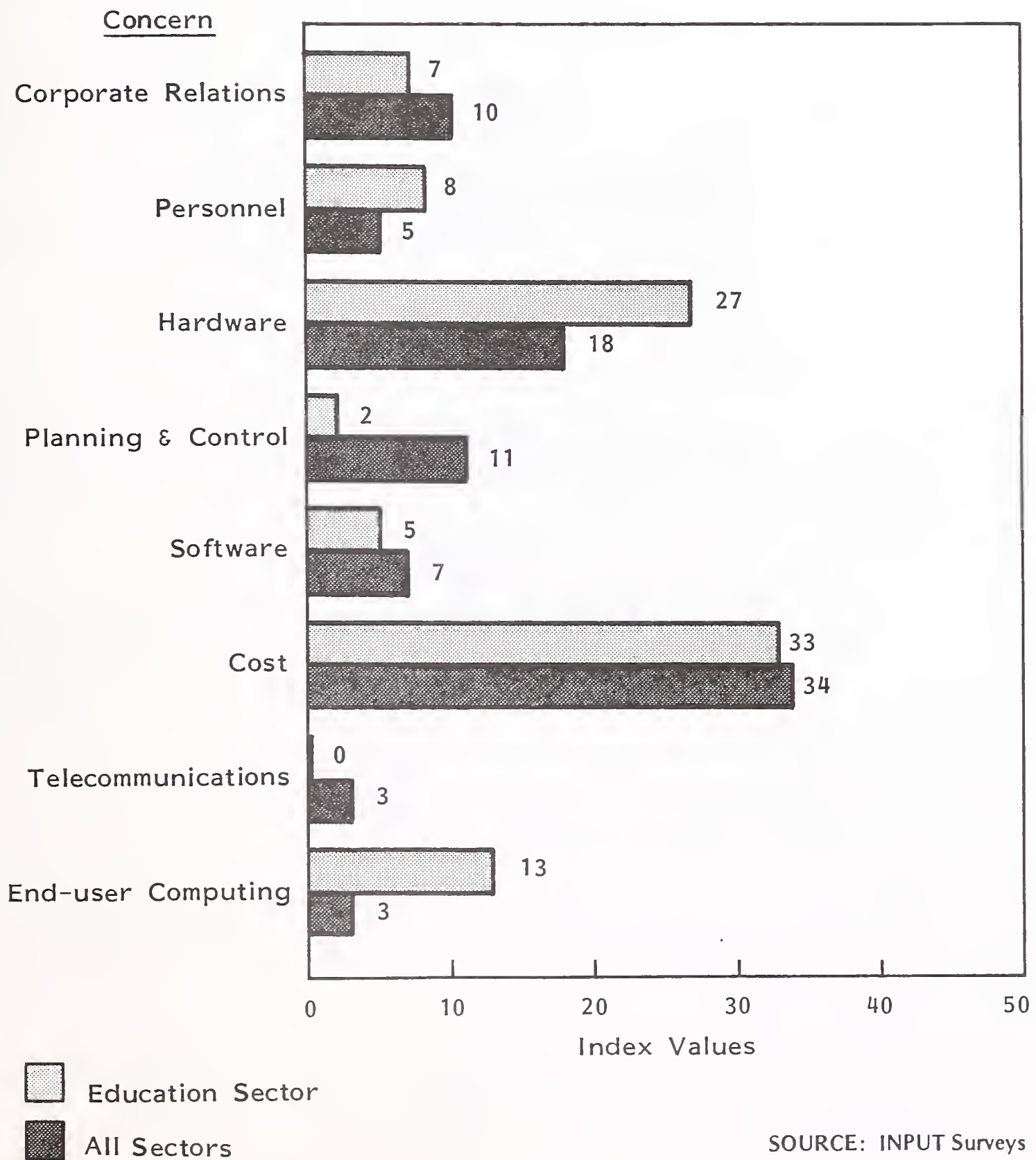
EXHIBIT IV-101

1983 BUDGET DISTRIBUTION AND 1983/1984 CHANGES
IN THE EDUCATION SECTOR

BUDGET CATEGORY	1983 PERCENT OF I.S. BUDGET	1983-1984 EXPECTED BUDGET GROWTH
Personnel Salaries and Fringes	51.4%	4.2%
Mainframe Processors	9.6	(0.2)
Minicomputers	1.0	1.1
Micro-personal Computers	4.1	37.7
Terminals	3.1	0.6
Peripherals	3.8	5.8
Total Hardware	21.6%	8.3%
Communications	7.0	5.3
External Software	2.5	6.2
Custom Programming	1.5	0.2
Integrated Systems	0.0	0.0
Total Software	4.1%	3.9%
Software Maintenance	3.0	2.7
Hardware Maintenance	6.9	0.6
Total Maintenance	9.9%	1.2%
Outside Processing Services	0.9	13.1
Other	5.2	1.2
Total	100.0%	7.1%

EXHIBIT IV-102

RELATIVE IMPORTANCE OF SENIOR MANAGEMENT CONCERNS IN THE EDUCATION SECTOR



- They are less concerned with planning and control issues.

b. Problems

- The education sector reports very different weights for problems than do other sectors. Personnel and cost loom largest as problems, as shown in Exhibit IV-103.
- Much less concern than in other sectors is expressed for planning and control and software issues.
- Exhibit IV-104 lists the planning issue subgroups that education IS managers rate as their top problems.

c. Objectives

- The premier objectives for the education sector are hardware issues, as shown in Exhibit IV-105. Telecommunications and end-user objectives also command special attention.
 - The specific hardware objective receiving greatest attention is up-grades - which is to be expected, in light of the education sector's objective of increasing the use of systems by faculty, staff, and students.
 - Network objectives are also rated high.
- Surprisingly - in light of the interest expressed in them as a problem - personnel objectives are not rated highly. Neither are software or planning and control objectives.
- Exhibit IV-106 enumerates the planning issue subgroups that the education IS managers rate as their most important objectives.

EXHIBIT IV-103

RELATIVE IMPORTANCE OF INFORMATION SERVICES PROBLEMS
IN THE EDUCATION SECTOR
(IMPORTANCE TO I.S. MANAGERS)

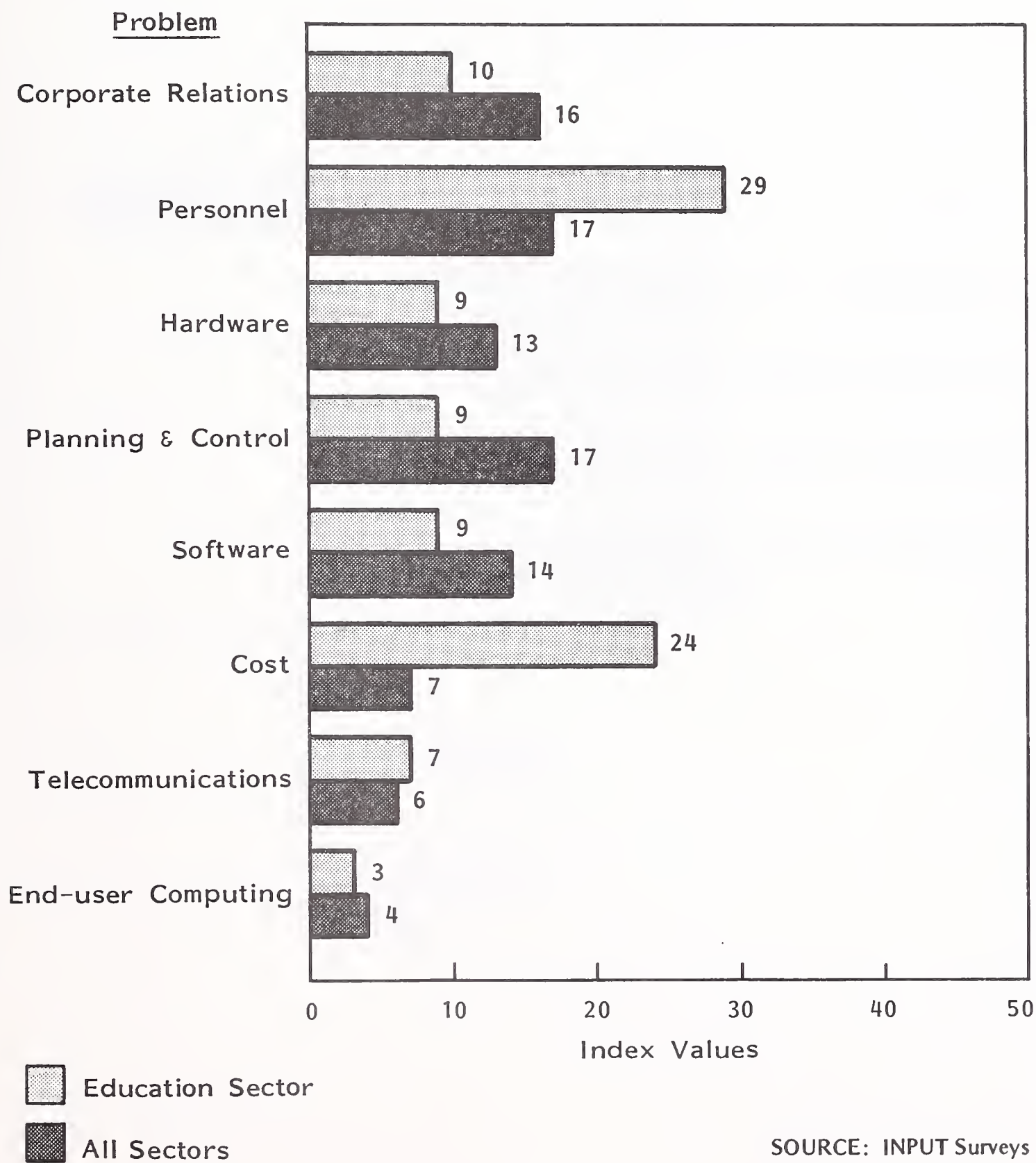


EXHIBIT IV-104

TOP FIVE INFORMATION SYSTEMS PROBLEMS FOR THE
EDUCATION INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)

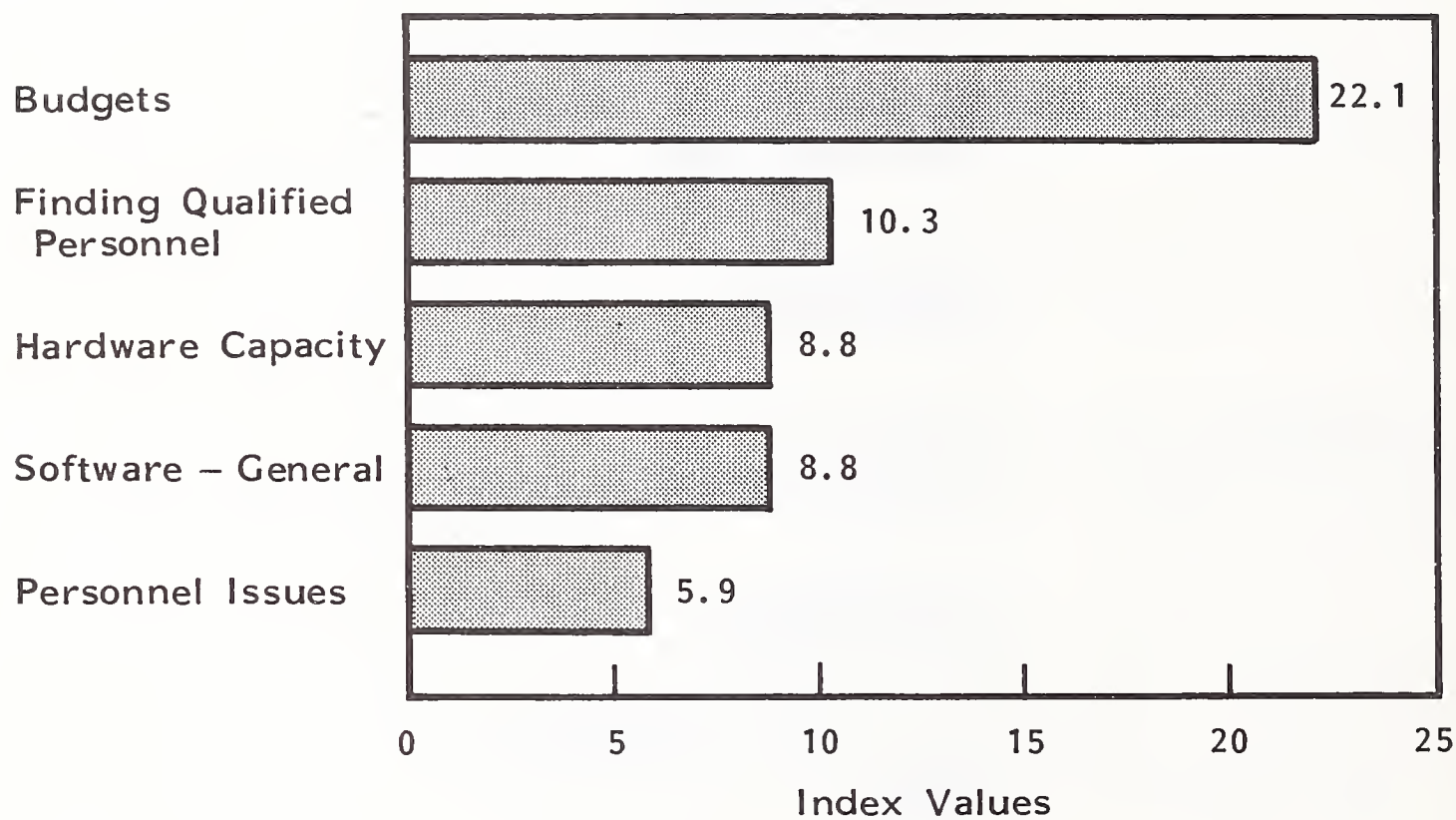


EXHIBIT IV-105

RELATIVE IMPORTANCE OF INFORMATION SERVICES OBJECTIVES IN THE EDUCATION SECTOR (IMPORTANCE TO I.S. MANAGERS)

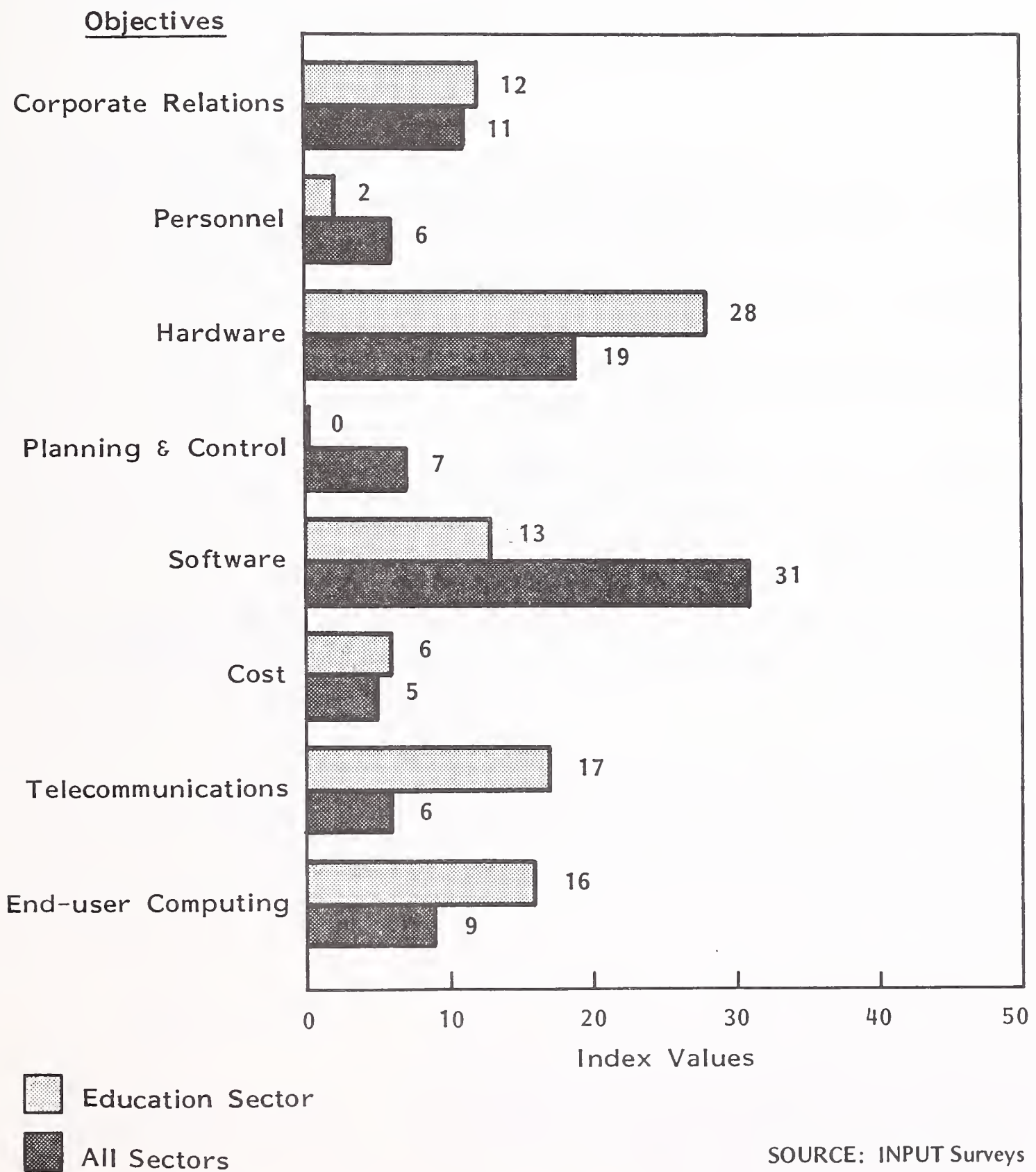
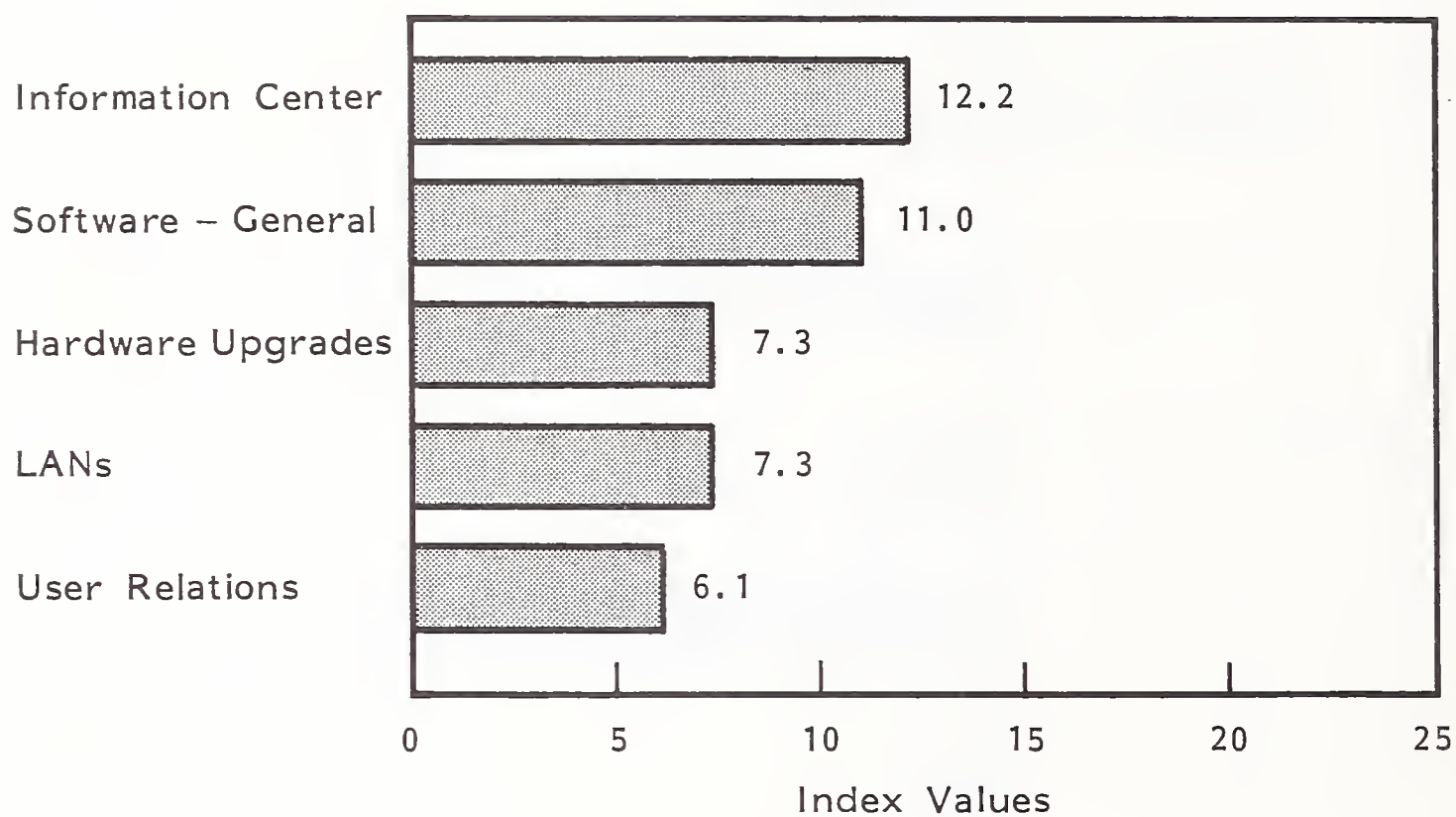


EXHIBIT IV-106

TOP FIVE INFORMATION SYSTEMS OBJECTIVES FOR THE
EDUCATION INDUSTRY
(IMPORTANCE TO I.S. MANAGERS)



4. APPLICATIONS

- The top five information systems applications planned by managers in the education industry are shown in Exhibit IV-107. Forty-five percent of the respondents said that they will be developing cross-industry applications, while the remaining 55% said they will be developing industry-specific applications.
- More information systems managers plan to develop student data base applications. Also being considered for 1984 are financial aid processing applications. Other education-specific applications include registration, transcript transfer, and alumni record applications.
- Some respondents expect to develop payroll and accounts payable applications in the next year.
- No significant events affected applications development within the schools interviewed.
- Information systems managers in the process manufacturing industry reduce the time and costs associated with program development by using application development tools.
- The most significant event affecting applications development within the education industry was the demand for computer science graduates.

5. END-USER COMPUTING

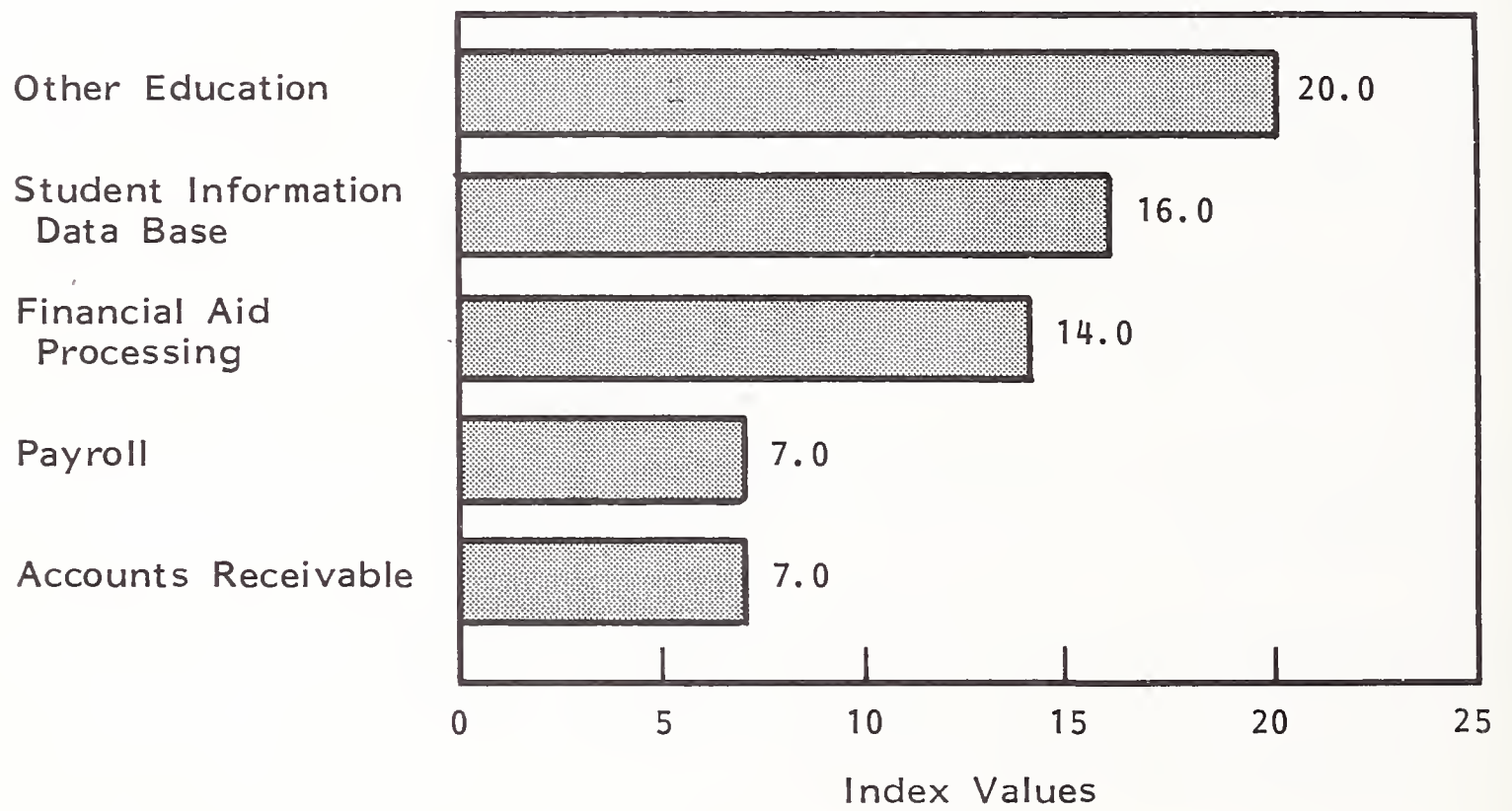
a. Office Systems

- PBXs will be the fastest growing office systems application in the education sector, with two-fifths of our respondents reporting that they intend to install

EXHIBIT IV-107

RELATIVE IMPORTANCE OF TOP FIVE INFORMATION SYSTEMS APPLICATIONS
FOR THE EDUCATION INDUSTRY

(IMPORTANCE TO I.S. MANAGERS)



PBXs by the end of 1984, as can be seen in Exhibit IV-108. Less than a sixth have PBXs now.

- Word processing is already widely used, but electronic mail is also very pervasive; over two-thirds of our respondents already have electronic mail systems in operation.
- Local-area networks are also relatively common, and will be in three-quarters of our respondents' environments by the end of 1984.
- Televideo conferencing is now used by almost a sixth of our respondents, and another fifth will be using it by the end of 1984.
- Telecopiers and facsimile devices are seldom used.

b. Personal Computers

- Almost nine-tenths of our respondents in the education sector report personal computers in their organizations. On average, there are 300 PCs in each organizational entity; by 1986, there will be 1,290, reflecting a compound growth rate of 63%, as shown in Exhibit IV-109.
- About 1% of the personal computers in this sector communicate with other devices. Over three-fifths of our respondents report some links with in-house computers, a sixth report links with other personal computers or word processors, and less than a tenth have PCs communicating with outside services, as shown in Exhibit IV-110.

EXHIBIT IV-108

OFFICE SYSTEMS AND COMMUNICATIONS SERVICES USAGE FOR THE EDUCATION INDUSTRY

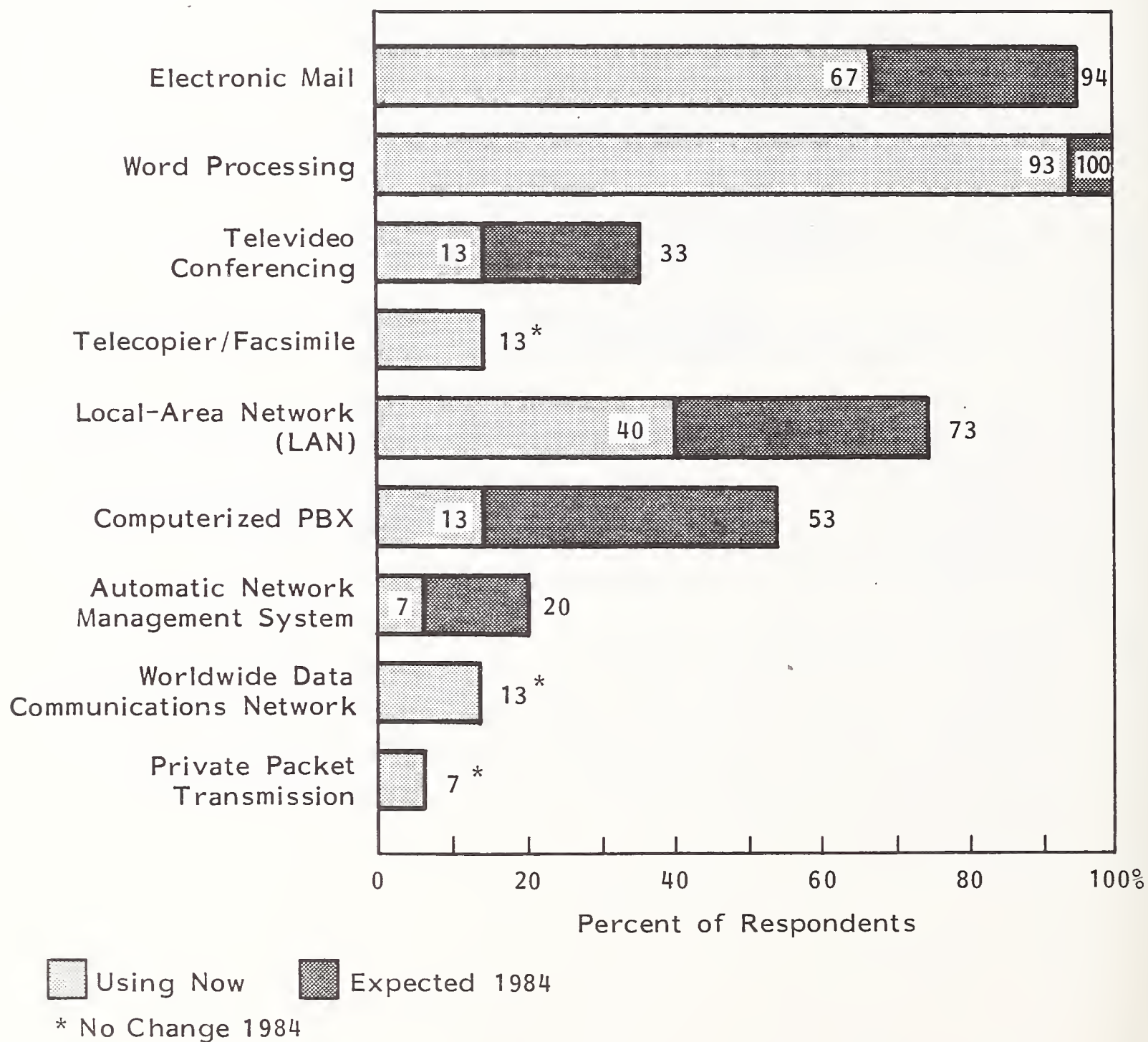
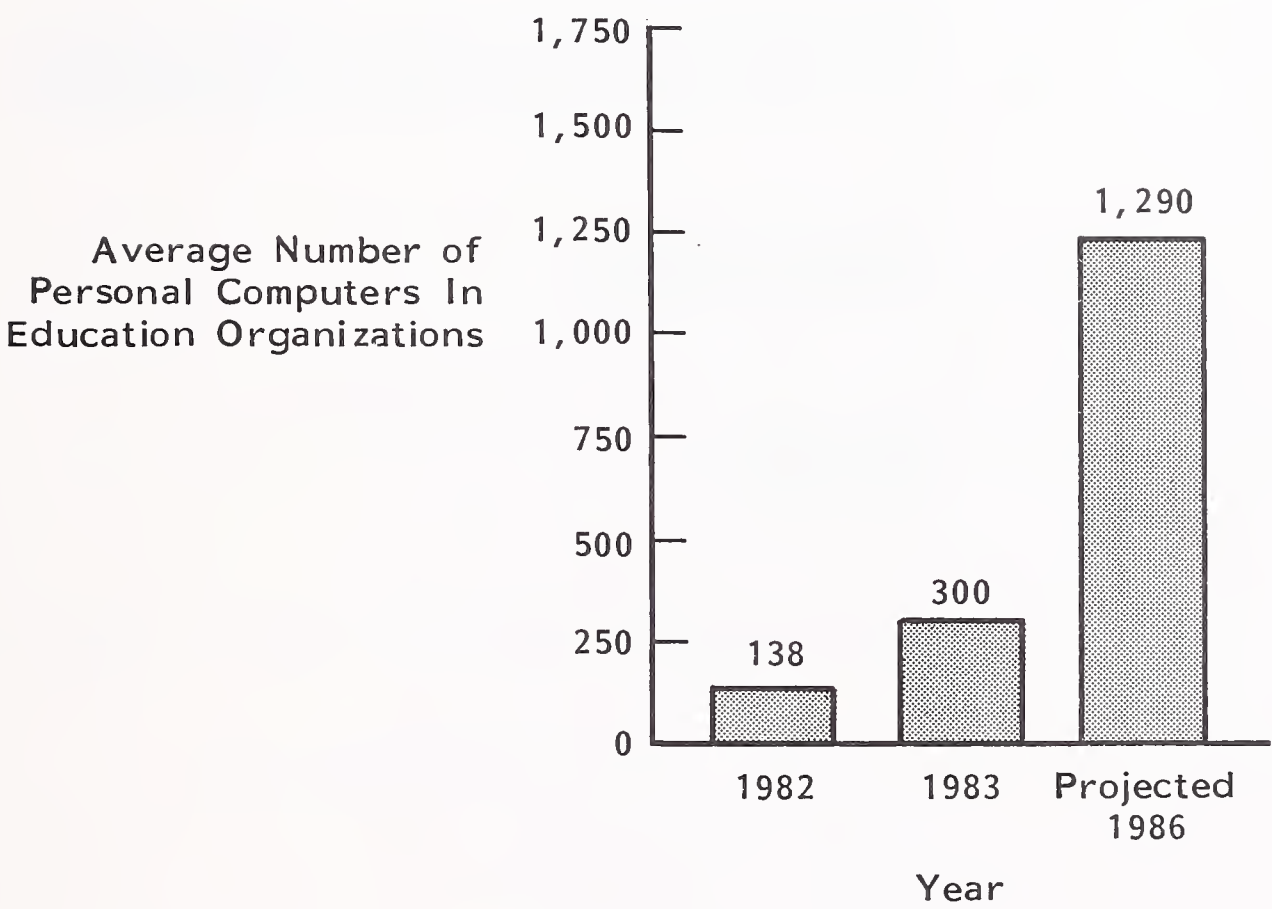


EXHIBIT IV-109

NUMBER OF PERSONAL COMPUTERS IN
EDUCATION SECTOR ORGANIZATIONS



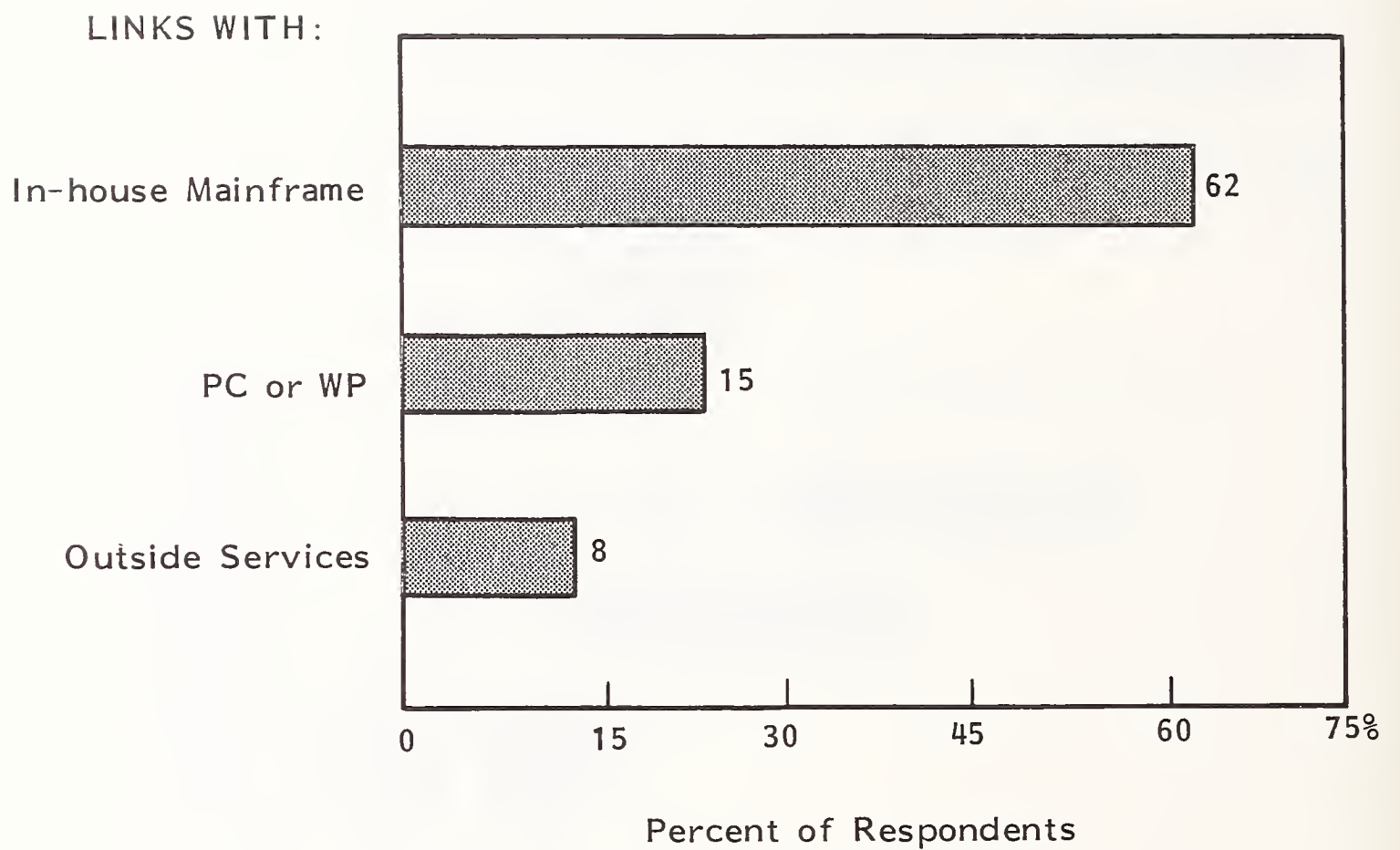
Compound annual growth rate, 1983-1986: 63%

* Respondent Estimates

SOURCE: INPUT Survey

EXHIBIT IV-110

CURRENT PC COMMUNICATION
IN THE EDUCATION SECTOR



Percent of PCs linked with other systems: 1%

SOURCE: INPUT Survey

APPENDIX A: PROFILE OF INTERVIEWED ORGANIZATIONS

APPENDIX A

PROFILE OF INTERVIEWED ORGANIZATIONS (Revenues)

- Data for the 1983 Annual Report was obtained from 321 responding organizations distributed as follows:

SECTOR	UNDER \$250 MILLION	\$251 MILLION TO \$1 BILLION	OVER \$1 BILLION	UNKNOWN	TOTAL
Discrete Manufacturing	29	8	16	2	55
Process Manufacturing	11	11	18	1	41
Transportation	8	5	1	0	14
Medical	7	2	3	0	12
Services	18	4	6	2	30
Utilities	10	7	7	0	24
Distribution	17	12	8	3	40
Banking and Finance	9	6	18	2	35
Insurance	17	2	9	1	29
Government	9	4	1	4	18
Education	10	3	1	1	15
Other	3	1	3	1	8
Total	148	65	91	17	321

APPENDIX B: QUESTIONNAIRE

INPUT's 1983 Information Systems Executive Panel

A. DEFINITIONS

- Company — a separate, legal and business entity that may or may not belong to a parent organization.
- Information Systems (IS) Organization — the organizational entity in a company that is responsible for data processing, programming, etc. (i.e. EDP or MIS).

B. FINANCIAL INFORMATION

☐ Division/Sub.☐ Entire Company

1. Please supply the following data for your company:

- Primary business or activity of your company _____
- SIC code (if known) _____
- 1982 annual revenues (\$ millions) _____, or assets (\$ millions) _____, or total budget authority (\$ millions) _____
- Total number of employees _____, number of IS employees _____

2. Please categorize your 1983 information systems (IS) budget and indicate the expected rate of change for 1984.

CATEGORIES	1983 IS BUDGET Amount (000)	ANTICIPATED PERCENT CHANGE IN 1984
		Percent (- for decrease)
Personnel		
Personnel salaries	\$	
Hardware		
Mainframe processors	\$	
Minicomputers	\$	
Microcomputers/personal computers	\$	
Terminals	\$	
Peripherals	\$	
Communications		
Data communications hardware, software, and line costs	\$	
Software & Services		
External software products	\$	
Custom programming	\$	
Integrated Systems (i.e., turnkey)	\$	
Software maintenance	\$	
Hardware maintenance	\$	
Outside processing services	\$	
Other(please specify) _____	\$	
Total	\$	

3. Does the personnel salary amount include fringe benefits. ☐ Yes ☐ No
Fringe benefit rate = _____ %
4. Does the personnel salary amount include an overhead charge ☐ Yes ☐ No
Overhead rate = _____ %
5. Do the non-personnel budget categories include an overhead charge ☐ Yes ☐ No
Overhead rate = _____ %
6. To what extent are these figures dependent on your organization's general economic condition? (Check as many as apply.)
- ☐ IS budget will increase if profits increase
 - ☐ IS budget will decrease if profits decrease
 - ☐ IS budget will not be affected by organizational profitability
 - ☐ Other: _____
7. What was your total 1982 IS expenditure? (\$ thousands) _____
8. Please indicate IS expenditures that are not in your budget but are spent within the budgets of the end users whom you serve.
- 1983 End-user IS Expenditures (\$ thousands) _____
- Anticipated Percent Change in 1984 (- for decrease) _____
9. If the total in question 8 is the "tip of the iceberg," please estimate what the additional amount might be: (\$ thousands) _____ ☐ Don't Know

10. What type of mainframe hardware does your organization operate?

NUMBER INSTALLED	VENDOR	MODEL	CODE

D. GENERAL

11. What do you consider to be your top three problems (with "1" being the most serious)?

1. _____ CODE _____

2. _____ CODE _____

3. _____ CODE _____

What are your top three objectives to accomplish in the next 12 months (with "1" being the most important)?

1. _____ CODE _____

2. _____ CODE _____

3. _____ CODE _____

12. How do you rate your organization's progressiveness in the following areas compared to all other companies? (Circle appropriate response.)

<u>AREA</u>	<u>LEADING EDGE</u>	<u>NEAR LEADING EDGE</u>	<u>AVERAGE</u>	<u>BELOW AVERAGE</u>
Use of personal computers	4	3	2	1
Personal computer mainframe links	4	3	2	1
Office systems implementation	4	3	2	1
Local area network implementation	4	3	2	1
Mainframe hardware	4	3	2	1
Mainframe operating systems	4	3	2	1
Telecommunications	4	3	2	1
Information Center	4	3	2	1
Fourth generation languages	4	3	2	1
Distributed processing	4	3	2	1
Other (specify)	4	3	2	1

13. What will be the most significant change affecting the IS department in the next three years?

CODE _____

F. APPLICATIONS

14. Please indicate the three most important applications which you will be developing or installing in the next twelve months (with "1" being the most important). Please indicate the size of the application in person-months for in-house development or dollar cost for external. If the application will be developed both in-house and external (e.g. modifying a software package) complete both sections.

APPLICATION	CODE	IN-HOUSE (PERSON MONTHS)	EXTERNAL		
			SOURCE		
			SFW. PROD	CUSTOM	COST
1.					
2.					
3.					

15. What was the most significant event which affected applications development during the past twelve months?

CODE _____

WHY? _____

16. What measures, if any, are you taking to reduce the time and costs associated with program development?

CODE _____

17. What is the most significant event within your company's industry that affected your applications development activities in the last twelve months?

CODE _____

18. The head of the IS department reports to:

____ President/Chief Executive Officer
____ Vice President, Finance
____ Vice President, Administration
____ Vice President, Operations
____ Other _____

H. END USER COMPUTING

Personal Computers

19. How many personal computers do you estimate are in your company?

[illegible]

COMPANY

20. How many personal computers communicate with (check all appropriate responses):

In-house mainframe

Personal computer or word processor

Outside service

Other (please specify)

21. How many full time equivalent IS personnel support PCs? _____

22. What have you done that you consider is especially effective in the areas of PCs?

CODE

Office Systems

23. Please indicate which of the office systems and communications services listed below are currently being used or planned, and indicate whether the IS department has management responsibility for them. (Circle appropriate answer.)

CATEGORY	STATUS/PLANS					IS RESPON- SIBLE (Y/N)
	USING NOW	LIKELY 1984	NO PLANS	DON'T KNOW		
Electronic Mail	3	2	1	0		_____
Word processors	3	2	1	0		_____
Televideo conferencing	3	2	1	0		_____
Telecopier/facsimile	3	2	1	0		_____
Local Area Network (LAN)	3	2	1	0		_____
Computerized PBX	3	2	1	0		_____
Automatic network management system	3	2	1	0		_____
Worldwide data com- munications network	3	2	1	0		_____
Private packet trans- mission (X.25)	3	2	1	0		_____

24. How many full time equivalent employees does your company have supporting office systems? _____

25. Where in the organization does the office systems group report? _____

CODE _____

Information center

26. Does your IS department currently supply Information Center (IC) services to end users? YES _____ (Go to question) NO _____
27. Is it likely such IC services will be initiated within the next twelve months? YES _____ NO _____ (Skip to question 32)
28. How many people use the IC regularly? _____ How many will there be in three years? _____

29 Which three departments use the IC the most (in order of usage)?

1. _____ CODE _____
2. _____ CODE _____
3. _____ CODE _____

30. How many full time equivalent people support the Information Center? Now _____ In three years _____

31. Where in the IS department does IC report? _____
_____ CODE _____

Telecommunications

32. What network control software are you presently using or plan to install in the next three years?

NETWORK CONTROL	NOW USING	LIKELY INSTALL IN 3 YEARS
Bisync _____		
SNA _____		
X.25 _____		
Other _____		

33. In network operations, what communications sources do you use now, and how will this change in the future?

TELEPROCESSING COSTS NOW IN THREE YEARS

Standard Bell System _____

Private Network _____

Specialized common carrier _____
(e.g. MCI, Satellite)

Value added carrier _____
(e.g. Telenet, Tymnet)

100%

100%

34 What is the extent of your local network activities, if any?

LOCAL NETWORK		DEVICES HOOKED UP	
Name	Code	1983	1984
1.			
2.			

35. What do you consider to be the most important communications developments in the last twelve months?

CODE _____

Software

36. In each of the following areas, please indicate the major software system used and future changes you project.

	CURRENT SYSTEM(S)	CODE	CHANGE IN NEXT 12 MONTHS	CODE
Operating system(s)				
Data base management system(s)				
Other significant software develop- ment aids _____ _____				

External Information Services Expenditures

37. Has your IS department served as an early user of new vendor hardware or software products or services within the past two years? YES 1 NO 0

For which products or services?

NAME

VENDOR

CODE

1. _____
2. _____
3. _____

GENERAL

38. What departmental needs are not being satisfied by vendors?

CODE _____

39. What are the major senior management concerns regarding computer or communications developments or activities?

1. _____ CODE _____
2. _____ CODE _____
3. _____ CODE _____

40. What other comments do you have concerning information systems trends, problems, or opportunities?

END OF INTERVIEW. THANK YOU!

APPENDIX C: RELATED INPUT REPORTS

APPENDIX C: RELATED INPUT REPORTS

- Impact of Office Automation on Productivity, November, 1983.
 - Focuses on the potential productivity gains from office automation and the factors that will affect the actual productivity increase. Includes recommendations on the best opportunity areas for increased office productivity.
- Intercompany Electronic Information Distribution, September, 1983.
 - Identifies elements of successful and unsuccessful intercompany communications projects. Includes discussion of the role of value-added networks.
- Local Area Network Developments, December, 1983.
 - Addresses major issues in the fast changing area of LAN, including the impact of recent standards agreements, technology forecasts, upcoming vendor shakeouts, and criteria for deciding implementation and timing.
- Maximizing the Acceptance of New Systems, December, 1983.
 - Why does the acceptance of office systems vary so dramatically between organizations? This report identifies key factors and tech-

niques that have been proven effective for increasing installation acceptance.

- Methods of Cost/Benefit Analysis for Office Systems, September, 1983.
 - Describes effective techniques of data collection and analysis. Identifies limits of the quantitative approach as well as measurements to be avoided. Includes case studies.
- The Opportunities of Fourth Generation Languages, September, 1983.
 - Analyzes the extent that fourth-generation languages are used and how they fit into the information systems strategy.
- Organizing the Information Center, August, 1983.
 - Currently (and for the foreseeable future) the primary FGL delivery vehicle is the information center. Consequently, the FGL and information center strategies and support should be well coordinated.
- Personal Computers and the IS Strategy, December, 1982.
 - This report recommends the most effective ways for IS to become involved with PCs.
- Personal Computers Versus Word Processors: Resolving and Selection Dilemma, June 1983.
 - Compares and contrasts PC and WP roles in the office environment for today and the future. It also includes a methodology to assist decision makers in making cost-effective selections that reflect each organization's unique environment.

- Relational Data Base Developments, August, 1983.
 - This report defines, evaluates, and projects future directions of relational data base systems. It also provides guidelines for user selection and application of relational data bases.

- Selecting User Friendly Operating Systems for Personal Computers, June 1983.
 - This report establishes criteria and provides recommendations for selecting PC operating systems for different types of organizational environments.

- Software Productivity Tools and Aids, December, 1983.
 - Many companies have introduced software productivity methods into at least part of their system development activities. Here is an update of what new or revised techniques are now available and working, what is coming by the mid-1980s, and how all techniques can best be applied.

- Supporting Personal Computer Software, August, 1983.
 - As FGLs become PC-based, the issues of ongoing PC software support become important in the successful use of FGLs.

- Upcoming Videodisk Products, April 1983.
 - 1983 will see the introduction of several commercial videodisk products aimed at computer installations. This analysis discusses what price levels to expect if performance lives up to promises, and in what situations magnetic media will still have advantages.

